ARITHMETIC WE USE

GRADE 5

ARITHMETIC WE USE

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GRADE V

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INTRODUCTION

Basic Plan of the Series. The modern arithmetic program recognizes two major phases of the subject, namely, the mathematical phase and the social phase. The purpose of the mathematical phase is to teach the nature of the number system. The purpose of the social phase is to help the pupil to understand and to utilize effectively the quantitative procedures that he will need daily in the social order of which he is a part.

The basis of instruction throughout this series of textbooks is (1) the number system and (2) its social significance. Through carefully planned activities the pupil is taught to understand the nature of the number system. This understanding insures a meaningful grasp of the procedures that are presented in the various computational processes. At the same time the pupil is led to see the social significance of arithmetic through the study of rich informational units of work dealing with everyday applications of number processes and quantitative procedures. In addition, numerous activities are suggested which require pupils to investigate social applications of arithmetic in their own communities. This plan insures a well integrated treatment of both phases of the subject.

Scientific Gradation of Subject Matter. To insure successful growth in arithmetic power, the authors have carefully considered the findings of important investigations of grade placement of arithmetic topics, and have made extensive surveys of their own, to determine the most satisfactory points at which to present the various elements of the work. As a result, the work of each grade has been considerably simplified and the teaching load greatly reduced. The easier phases of a topic,—for example, division with two-figure divisors,—are presented at least one year previous to the introduction of phases known to be more difficult for children to learn. This scientific gradation of the subject matter insures easy learning and mastery of the various processes.

The major phases of arithmetic processes taught in Grade 5 are as follows:

1. Multiplication by two-figure multipliers only.
2. Division by two-figure divisors, when the trial quotient need not be corrected.
3. Addition and subtraction of like fractions only.
4. Addition and subtraction of easy decimals.

Basic Elements of a Readiness Program. Recent investigations by the authors and others have demonstrated conclusively that many pupils are not ready for the new work that is about to be presented. This may be due to the fact that they have had little, if any, previous contact with the topic to give it meaning, or it may be due to weaknesses in underlying skills that they have

not yet mastered. Unless these deficiencies are discovered and corrected before the new work is begun, it is practically certain that serious maladjustments will result.

The authors have taken two major steps to insure pupil readiness for the new work. The first step has been to make certain that the pupil has direct contact with important concepts, for example the meaning of fractions, long before he is required to compute with them. The authors believe that meaning gained through experience should always precede practice for mastery. The second step has been the provision of a complete series of experimentally-developed readiness tests which enable the teacher to locate the pupils likely to have difficulty with the new work and to locate the points that are likely to lead to the difficulty On the basis of the information revealed by these readiness tests, the teacher can either do any reteaching that may be required, or adjust the subsequent instruction in the new step to the needs of each individual.

Teaching Procedures that Insure Mastery of Arithmetic. These textbooks present an instructional program that has been thoroughly tested in hundreds of schools. They provide a systematic step-by-step development of the fundamental operations in such a way that each step is both mathematically meaningful and socially significant. Illustrations, pictures, diagrams, and other kinds of visual aids are extensively used to help the pupils to get an insight into the mathematical meaning of the step being presented. Following this concrete development of a step, there are worked-out models for study and solution before practice on the new step is begun. The explanations of procedure are specific and detailed so that the difficulties learners sometimes encounter in the study of arithmetic are reduced to a minimum. Diagnostic tests keyed to study helps and remedial practice are provided at frequent intervals to assist the teacher in locating pupils' needs for additional instruction. These tests make it possible for the teacher to provide effectively for individual differences. They also insure intelligent cooperation by the learner toward the correction of any difficulties he may encounter. The skills that have been taught are frequently reintroduced in the units of problem material to insure proper maintenance. Frequent mixed drills of a cumulative nature are also provided. The problems illustrating the applications of the processes are stated in simple language that children understand.

Analysis of the Features of the Series. To assist teachers and members of textbook committees in their use and evaluation of this textbook, the detailed analysis of features given below is provided. Similar analyses for the other books of the series are included in each textbook. In instances where the number of page references that might be given is very large, only typical pages are listed. The reader should consult the index for additional details.

1. Recognition of the social phase of arithmetic

a. Problem units dealing with social applications of arithmetic: 1, 3, 9, 15, 16, 40, 56, and more than 75 other units

b. Correlations with other areas of the curriculum

(1) Health: 31, 106, 115, 195, 281, 282, 302

(2) Social studies: 1, 16, 22, 40, 56, 71, 73, 76, 89, 110, etc.

(3) Science: 134, 170, 179, 190, 192, 194, 237, 251, 293

(4) Arts and Music: 122, 153, 166, 220, 239

(5) Safety: 83, 196, 238, 299

c. Wide variety of illustrations, graphic and tabular materials, pictures, and business forms: 3, 6, 16, 22, 23, 47, 90, 96, 97, 134, 177, and many others

d. Vocabulary development: 32, 35, 41, 79, 80, 123, 124, 158, 199, 233, 264, 267, 268, 303

2. Meaningful mathematical development of number processes

a. Consideration of the nature of the number system as such: 12, 13, 20, 24, 48, 49, 50, 51, 52, 86, 93, 100, 109, 148, 247, 271, 272, 276, 277, 284, 285, 286, 287, 291, 292

b. Each new step presented in a social setting

(1) Multiplication by two-figure multipliers: 48, 49, 50, 59, 60, 61, 65, 70

(2) Addition of like fractions: 91, 92, 98, 102, 103, 164, 165, 168

(3) Subtraction of like fractions: 113, 114, 116, 117, 180, 181, 182, 183, 185, 186, 188, 189

(4) Division by two-figure numbers: 130, 132, 135, 137, 139, 141, 142, 145, 204, 208, 211, 213, 218, 219, 220, 222, 223, 226, 227, 228

(5) Addition of decimals through hundredths: 276, 277, 291

(6) Subtraction of decimals through hundredths: 279, 280, 292

c. Models for study and solution before formal practice: 49, 60, 65, 69, 70, 91, 98, 102, 103, 113, 114, and many others

d. Helps on difficult steps, including visualization: 100, 101, 104, 116, 118, 145, 162, 163, 168, 169, 180, 181, 182, and many others

e. Relationship between processes stressed: 60, 276, 277, 279, 284

f. Practice on new steps: 48, 49, 55, 60, 61, 65, 69, 70, 91, 98, 102, 103, 113, 114, and following every model

g. Diagnostic tests keyed to locate specific difficulties: 75, 95, 108, 119, 154, 176, 197, 229, 301

h. Mixed practice to insure retention of skills presented: 41, 53, 57, 67, 79, 87, 95, 103, 105, 107, 115, 117, etc.

i. Cumulative keyed review tests and practice exercises: 44, 82, 126, 160, 202, 236, 270, 306

3. Development of power to apply quantitative procedures

a. Utilization of experiences within interest range of children: 1, 3, 9, 16, 22, 23, 31, 40, 45, 53, 56, 59, 67, 71, etc.

b. Special helps on problem solving, including reading exercises: 26, 32, 34, 35, 36, 37, 38, 39, 54, 58, 62, 63, 64, 66, 68, 74, 78, 94, 100, 109, 118, 133, 148, 225, 247, 262

c. Original problems to be prepared by pupils: 34, 50, 52, 53, 73, 133, 147, 156, 184, 190, 207, 209, 214, 216, 217, 227, 238, 254, 256, 287, 304

d. Activities requiring applications to new situations: 20, 26, 47, 52, 59, 62, 64, 77, 92, 105, 118, 144, 146, 227, 238, and many others

e. Pictures and illustrations to be discussed: 15, 18, 24, 47, 90, 152, 166, 177, 178, 181, 187, 240, 274, and others

f. Interpretation of graphs, maps, tables, charts, etc.: 3, 6, 9, 32, 134, 177, 244, 246, 253, 254, 255, 257, 259, 260, 265, 271, 274, 281, 282, 288, 289, 293, 295, 298, 302

4. Comprehensive testing program

a. Inventory tests: 2, 7

b. Diagnostic review tests to locate specific needs, plus the practice: 7, 10, 11, 14, 17, 19, 21, 25, 27, 29, 30, 33, 35

c. Readiness tests on new work to be presented: 46, 88, 112, 128, 273

d. Keyed diagnostic tests geared into the developmental work: 75, 108, 119, 154, 176, 197, 229, 301

e. Periodic cumulative diagnostic tests keyed to practice exercises: 44, 82, 95, 126, 160, 202, 236, 270, 306

f. Problem scales for measuring power in problem solving

g. Chapter reviews: 42, 80, 124, 157, 200, 234, 268, 304

5. Adaptation of instruction to individual differences

a. See the comprehensive testing program outlined under 4 for locating needs

b. Tests, study helps, and practice exercises for individualizing review at the beginning of the year's work (See 4a and 4b)

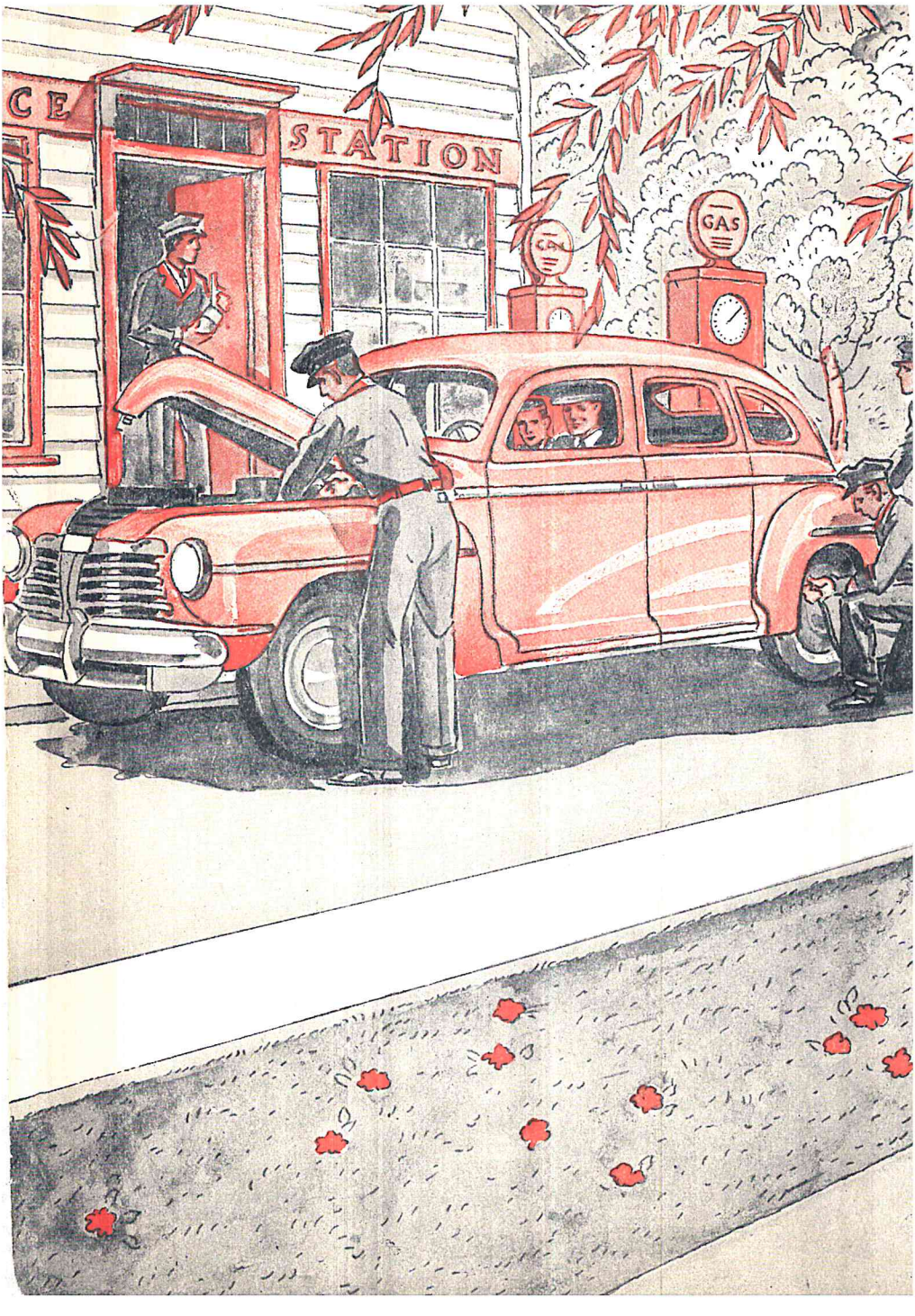
c. The readiness program and tests to help the teacher to locate possible sources of difficulty: 46, 88, 112, 128, 273

d. Starred problems and activities for enrichment and for the more able pupils: 13, 16, 21, 23, 24, 30, 40, 45, etc. (See almost any problem unit)

e. Topics for special reports as a means of exploring and developing pupil interests: 78, 129, 166, 194, 196, 203, 207, 210, 216, 231, 232, and many other pages

f. Special assignments and work for pupils not needing review or corrective work: 47, 75, 108, 129, 154, 176, 197, 216, 238, 256, 304.

Acknowledgments. The authors wish to make special acknowledgment of the numerous helpful suggestions by Mr. Lyle Hance which have added much to the merit of the materials included in these textbooks. The authors also wish to acknowledge the contributions of the many principals, supervisors, and teachers who have given generously of their time and energy in the experimental work underlying the series.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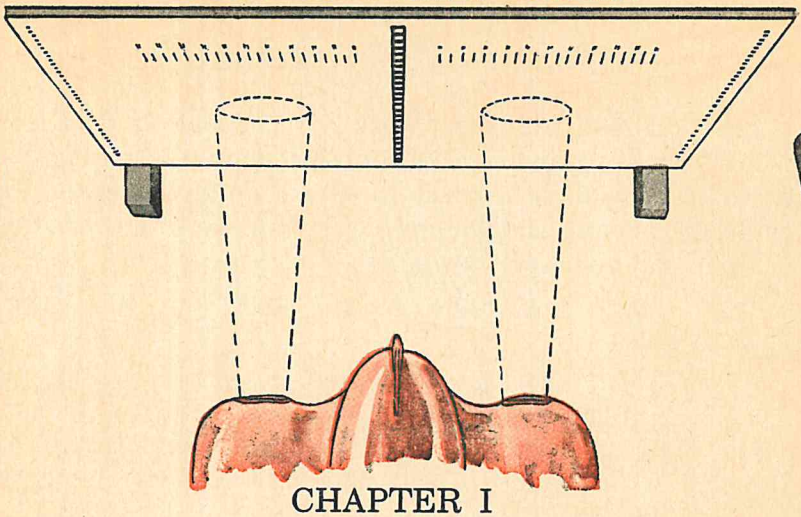
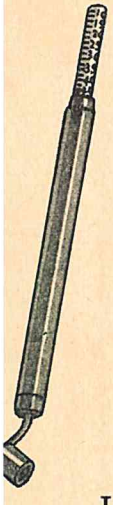
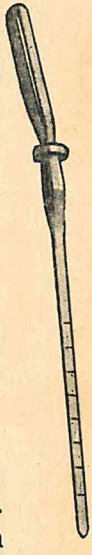






AIR PRESSURE GAUGE

OIL GAUGE

CHAPTER I

OFF TO A GOOD START!

Don's father, who is a doctor, has his car checked often. He wants to be sure his car is in perfect working condition at all times.

1. The pictures above show some of the ways in which important things about a car are checked. Tell what each thing in the pictures checks or measures.

2. The air pressure in the tires on the car was 21 pounds. It should be 30 pounds. How much too low was the air pressure?

3. The car needed 2 quarts of oil. So Don's father decided to have the oil changed. He paid $1.80 for the 6 quarts he needed. How much a quart was that?

4. Don's father thought that some of his tires were too badly worn to be safe. So he bought 2 new tires at $10.75 each. How much did he spend for the tires?

*5. Why is it a good plan to check up a car before starting on a long trip?

CHECK UP YOUR ARITHMETIC

Are you ready for new work in arithmetic? This test will help you to find out. It contains some of the kinds of examples you have learned to work. Copy the examples carefully, leaving enough space for your work. How many of them can you work correctly?

1. $\begin{array}{r} 8 \\ +96 \\ \hline \end{array}$

2. $\begin{array}{r} 43 \\ -3 \\ \hline \end{array}$

3. $\begin{array}{r} 802 \\ \times 4 \\ \hline \end{array}$

4. $3\overline{)279}$

5. $\begin{array}{r} 941 \\ -416 \\ \hline \end{array}$

6. $\begin{array}{r} 85 \\ \times 7 \\ \hline \end{array}$

7. $\begin{array}{r} \$6.00 \\ .13 \\ 37.86 \\ .04 \\ \hline \end{array}$

8. $4\overline{)\$7.88}$

9. $\begin{array}{r} \$8.59 \\ \times 9 \\ \hline \end{array}$

10. $\begin{array}{r} 764 \\ 889 \\ 994 \\ \hline \end{array}$

11. $\begin{array}{r} 8102 \\ -3073 \\ \hline \end{array}$

12. $8\overline{)8480}$

13. Multiply 985 by 8.
14. Subtract \$64.38 from \$132.04.
15. Divide 3546 by 7 and check your work.
16. Copy and add: \$56.86, \$6.47, \$.98, and \$7.05.

What Your Score Means (Number Correct)

Unsatisfactory	Fair	Good	Excellent
0 to 10	11 12	13 14	15 16

1. If you had 16 examples correct, your rating is "Excellent." What is your rating on the test?
2. How many in the class received each of the ratings?
3. Which of the examples did you not work correctly?
4. Can you tell what the reasons for your errors were?
5. Are there any examples that you did not know how to work? What arithmetic repairs do you need?

DON KEEPS AN ACCOUNT

Don earned the money for a camera to take on a trip. He earned the money mostly by selling magazines. His father gave him a **cashbook** and showed him how to keep an **account** of all the money he received and of the money he paid out. Here is his account for May.

19___ Received			19___ Paid Out		
May 4 Magazines	$ 1	05	May 10 Game		25
" 11 Magazines	1	15	" 18 Movie		15
" 15 Cut Smith's lawn		45	" 21 Repairs on bicycle		65
" 18 Magazines		95	" 25 Movie		10
" 25 Magazines	1	30	" 28 Cap	1	35
Total	4	90	" 31 Cash on hand	2	40
				4	90

1. How much cash did Don receive in all in May? Is the total correct?

2. For what things did Don spend money in May? How much did he pay out in all?

3. On May 31 he subtracted the $2.50 he had spent from the $4.90 he had received. How much more had he received than he had spent?

This shows that Don should have $2.40 in cash at the end of the month. This amount is called his **balance.** He counted the cash he had and found that he had $2.40 left. So he wrote, "Cash on hand, $2.40," in the "paid out" column. Then he added the numbers in the "paid out" column. His account balances because this total is the same as the total for "cash received."

*4. What kinds of mistakes might Don make in keeping his account and balancing it?

HOW TO CHECK YOUR WORK

You may easily correct your own mistakes in arithmetic if you learn how to check your work. The examples below show you how to check each of the fundamental processes.

Work	Check
45 ↓	45 ↑
63 ↓	63 ↑
81 ↓	81 ↑
28 ↓	28 ↑
217	217

To work an **Addition** example, find the sum by adding **down** the columns. To check, you find the sum by adding **up** the columns. If the two sums are the same, you can be quite certain that your work is correct.

1. **Add** and then check the examples below:

a.	*b.*	*c.*	*d.*	*e.*	*f.*
568	878	8596	25	7156	7938
492	59	267	5764	8030	16
728	397	785	398	7053	597

563	
−279*	
284*	> 563

To check this **Subtraction** example, add the numbers that have stars after them. What is the sum of 279 and 284? If this sum is the same as the top number of the example, the work checks.

2. **Subtract,** and then check the examples below:

a.	*b.*	*c.*	*d.*	*e.*	*f.*
753	987	935	3979	9900	7000
−231	−753	−286	−1995	−2816	−3507

To check **Multiplication,** go over the work again. If you get the same product both times, you can be almost certain that your work is correct.

3. **Multiply** and then check the examples below:

a.	*b.*	*c.*	*d.*	*e.*	*f.*
91	253	806	5784	$16.50	9004
×6	×7	×9	×8	×5	×4

Can you give other ways of checking multiplication?

Work	Check
49 r2	
5)247	49
20x	×5
47	245
45	+2
2	247

The box at the left shows you how to work and check the **Division** example 247 ÷ 5. To check the work, multiply 49 by 5. This gives 245. Then add the remainder, 2, to 245. If all the work is correct, this sum is the same as the number that was divided. Is the example worked correctly?

4. **Divide** and then check the examples below. Express the remainder in the quotients with **r** as shown above.

a. $5\overline{)57}$ *b.* $5\overline{)75}$ *c.* $9\overline{)816}$ *d.* $6\overline{)578}$ *e.* $7\overline{)5348}$

*5. Why may your work sometimes check and still be incorrect?

Practice in Checking Examples

Copy these examples one at a time. Work the example. Then check the work. If your work does not check, do the example again. Do not go on to the next example until the one on which you are working is correct.

Set I

1. 369 + 570 + 366 + 548 + 494

2. 8754 − 4865

3. 375 × 6

4. $5\overline{)895}$

5. 8052 − 3044

6. 984 × 3

7. $4\overline{)2938}$

Set II

1. 840 + 964 + 818 + 899 + 182

2. 9000 − 4068

3. 1963 × 8

4. $8\overline{)2435}$

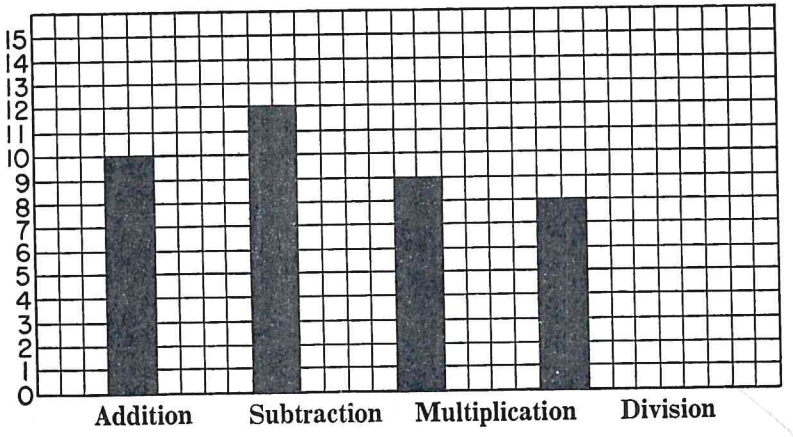
5. 8103 − 7046

6. 3579 × 9

7. $9\overline{)4891}$

WE LEARN TO PICTURE OUR TEST SCORES

The picture below shows the scores made by Henry Adams on each of the tests on page 7. Such a picture is called a **bar graph.** Study the graph to find the answers to the questions given below.



1. The black bars help you to find the score Henry made on each test. You can see that the bar above the word "Addition," at the bottom of the graph, reaches up to the dotted line drawn from 10 across the page to the right. This shows that in the addition test Henry had 10 examples correct. How many examples are there in the test?

2. How many did Henry have incorrect in the addition test? in each of the other tests?

3. On which test was his score highest? lowest?

4. If a pupil has more than two examples incorrect in one of the tests, he needs practice in that process. What processes does Henry need to practice?

*5. Make a graph like this one of your scores on the tests. On what processes should you practice?

WHAT PRACTICE DO YOU NEED?

These tests will help you to find the processes on which you need to practice. When possible, write the answers on folded paper placed below the examples. There are twelve examples in each test.

Addition

	a	*b*	*c*	*d*	*e*	*f*
1.	66	48	69	718	895	987
	83	35	87	249	360	759
2.	31	38	97	745	883	578
	43	42	86	504	970	728
	35	60	89	629	455	999

Subtraction

1.	873	805	629	874	827	760
	642	305	329	871	352	749
2.	800	9040	6217	5492	8100	9872
	556	7053	6208	4786	6804	5998

Multiplication

1.	94	90	832	702	905	800
	2	8	3	4	7	6
2.	58	718	681	678	967	974
	9	5	8	7	6	9

Division

1.	$3\overline{)690}$	$2\overline{)806}$	$4\overline{)484}$	$5\overline{)150}$	$8\overline{)848}$	$9\overline{)724}$
2.	$6\overline{)978}$	$7\overline{)94}$	$8\overline{)3792}$	$4\overline{)748}$	$9\overline{)1583}$	$5\overline{)8647}$

If you made more than two errors on the test for any process, you should practice that process. The directions on page 8 will help you to find the practice you need.

HOW TO IMPROVE YOUR WORK

The tests on page 7 have shown you the processes on which you need to practice. On the following pages there are practice exercises and study helps on each process. If you do the work carefully, you will find that you will improve very quickly. Be sure that you do not practice until you understand what you are to do and how to work the examples in each set.

I. Helps in Addition

1. Practice on Addition Combinations. Page 10
2. Adding by endings needed in Column Addition. Page 10
3. Easy Column Addition. Page 11
4. How to find your difficulties in addition. Page 14

II. Helps in Subtraction

1. Practice on Subtraction Combinations. Page 17
2. Study helps for working subtraction examples. Page 17
3. How to find your difficulties in subtraction. Page 19

III. Helps in Multiplication

1. Practice on Multiplication Combinations. Page 21
2. Practice on carrying in multiplication. Page 25
3. Study helps for easy multiplication. Page 25
4. Study helps for harder multiplication. Page 27
5. How to find your difficulties in multiplication. Page 27

IV. Helps in Division

1. Practice on Division Combinations. Page 29
2. Study helps for division without remainders. Page 30
3. Practice with uneven division. Page 30
4. Study helps in uneven division. Pages 28 and 33
5. How to find your difficulties in division. Page 35

WE KEEP AN ACCOUNT OF MONEY WE EARN

Draw lines on your paper to look like two pages in a cashbook such as Don used on page 3. Then write on this form the record of money Arthur and Anne received and paid out as given below. Then balance the accounts.

1. Arthur's account for October

Oct. 1	Received for working	$.75
Oct. 4	Spent for stamps	.10
Oct. 8	Earned running errands	.40
Oct. 9	Ticket for movie	.15
Oct. 16	Sold old paper	.35
Oct. 24	Bought kite	.25
Oct. 28	Paid for handle bars	1.09
Oct. 31	Earned raking leaves	1.25

2. Anne's account for December

Dec. 1	Cash on hand	$3.45
Dec. 3	Paid for postcards	.30
Dec. 6	Earned running errands	.35
Dec. 12	Ticket for skating rink	.15
Dec. 15	Paid for presents	2.08
Dec. 16	Ticket for movie	.25
Dec. 18	Earned at store	1.15
Dec. 20	Mailed presents	.47
Dec. 21	Gave to Red Cross	.50

*3. Keep an account of the money you receive and spend for one month. Balance your account.

IMPROVING YOUR WORK IN ADDITION

The Addition Combinations. To see how your work improves, keep a record of the number of combinations you have correct on three trials of this exercise. Write the sums on folded paper below each row. Do extra practice on all combinations that you miss more than once.

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*
1.	7	8	9	6	2	4	8	7	9	8	3
	8	3	6	8	7	9	6	9	9	5	6
2.	7	9	5	8	5	7	9	7	8	9	4
	6	3	7	8	8	5	7	7	9	4	5
3.	9	2	6	9	6	8	6	9	7	8	6
	8	9	7	5	9	4	6	2	4	7	4

Adding by Endings. Practice writing these sums. Then practice giving them orally.

Set I (No Bridging)

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*
1.	16	44	18	3	12	5	13	21	5
	2	4	1	16	5	12	4	5	13
2.	3	12	2	6	34	31	54	3	2
	15	6	21	13	3	6	5	12	17

Set II (Bridging the Tens)

1.	5	66	13	26	32	7	64	6	35
	26	9	7	5	8	33	6	14	7
2.	25	7	26	24	7	23	7	14	27
	9	29	7	7	15	8	27	19	7
3.	24	7	33	6	15	25	21	7	26
	8	26	9	26	5	8	9	18	8

Set III (Bridging)

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*
1.	9	18	9	29	38	9	28	9	19
	29	2	15	7	8	11	9	18	2
2.	19	9	39	18	9	8	39	8	18
	3	16	8	3	12	17	5	19	6
3.	8	18	19	9	29	38	9	49	9
	27	4	1	14	4	5	17	6	13

Column Addition. Practice writing the answers on a folded paper. Place a new fold beneath each line of examples.

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*
1.	5	2	1	5	6	5	1	5	6
	2	6	6	3	7	9	5	4	3
	1	1	2	1	4	4	2	1	5
2.	5	6	6	5	6	6	5	5	6
	8	4	9	7	8	5	5	6	6
	6	5	9	7	3	2	8	4	5
3.	9	7	3	7	9	7	8	7	9
	9	3	5	9	8	4	2	2	7
	5	9	9	1	4	5	7	8	7
4.	1	8	9	7	8	1	9	7	8
	9	6	6	8	8	7	3	5	4
	6	9	1	8	9	7	9	8	4
5.	9	7	8	8	1	9	7	8	9
	4	7	5	7	8	5	6	3	2
	9	8	8	9	7	7	7	1	8

WHAT OUR NUMBERS MEAN

1. On the lake there were 2 boats each having 10 boys in them and one boat with 5 boys in it. How many boys were there in the boats? 2 tens and 5 ones = ?

2. Show that 73 is 7 tens and 3 ones, or 73 ones.

3. In the number 857 what does the figure 8 stand for? the figure 5? the figure 7?

4. In a town there lived 7,648 people. Read this number. What does the comma in the number show? How many thousands are there in 7,648? What does the 6 stand for? the 4? the 8?

When there are more than three but less than seven figures in a number, we use a comma to separate the three figures at the right from the others.

5. Read the words and numbers below:

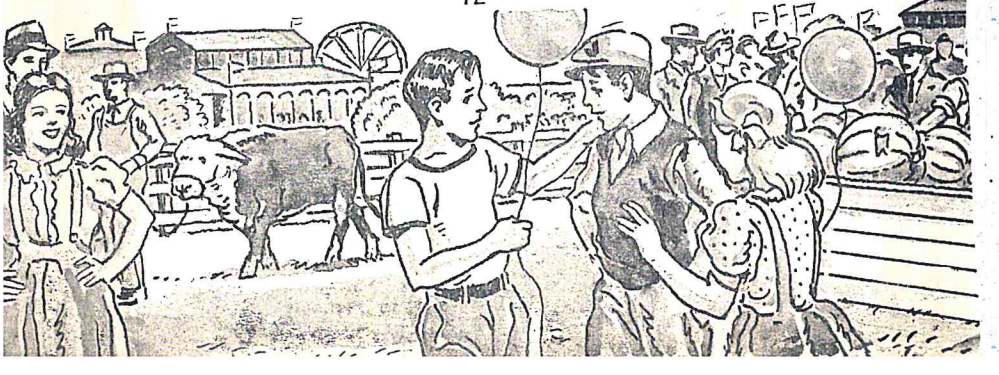
Fifteen thousand	15,000
Twenty thousand	20,000
Three hundred forty-six thousand	346,000

6. Read this sentence: The number of people who attended the State Fair was between 350,000 and 400,000. This is at least 25,000 more than attended last year.

7. In a recent year there were 253,146 public school buildings in this country. This number is read: two hundred fifty-three thousand, one hundred forty-six.

8. Read these numbers:

a.	5,216	26,736	102,000	728,964	45,065
b.	7,030	50,420	400,400	16,008	239,147



9. Copy the numbers below. Put a comma where it belongs in each number. Be ready to read the numbers.

a.	1478	26597	178402	396000	50000
b.	86750	177009	304065	87605	428647

10. Write each of the following in figures:

a. Twelve thousand forty-seven.
b. Ninety-five thousand six hundred twenty.
c. Three hundred five thousand seventy-five.
d. Sixty thousand nine hundred eighty-four.
e. Five hundred four thousand five hundred sixty-six.

We call a number like 875,462 a **six-place number.** Each place has a name.

The 2 is in ones' place. It means 2 ones or	2
The 6 is in tens' place. It means 6 tens or	60
The 4 is in hundreds' place. It means 4 hundreds or	400
The 5 is in thousands' place. It means 5 thousands or	5,000
The 7 is in 10-thousands' place. It means	70,000
The 8 is in 100-thousands' place. It means	800,000
The sum	875,462

11. Tell the name of the place of each figure in the numbers below and what each figure means:

9,715	26,875	97,462	85,906
797,865	1,496	302,650	100,000
396,785	60,708	590,873	39,001

12. Why may we speak of 0 as a "place holder"? In which of the numbers in question 11 did 0 hold one or more places? What places did it hold?

13. Show that 140 is 14 tens, or 140 ones.

14. Show that 2,650 is 26 hundreds and 5 tens, or 265 tens, or 2,650 ones.

15. Show in three ways the value of 3,785; 2,059; 4,607.

FINDING YOUR DIFFICULTIES IN ADDITION

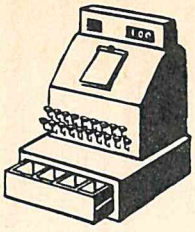
Do not be satisfied until you can work all of these addition examples correctly in less than the time allowed. Write on folded paper placed below the examples.

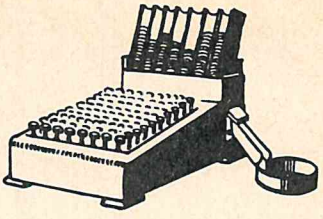
Set I

	a	*b*	*c*	*d*	*e*
1.	13	4	44	36	8
	3	35	6	9	35
	2			7	2
2.	32	24	12	550	600
	23	211	21	104	400
			30	322	302
3.	602	71	8209	213	45
	106	23	2010	4	3
	101	34		10	730
4.	359	644	229	6458	5908
	507	380	768	6497	8909

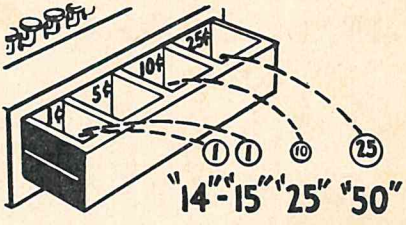
Set II

1.	59	8796	278	261	975
	65	4885	804	970	666
	77		818	507	899
2.	908	947	297	985	765
	203	605	39	8	9
	704	454	876	79	709
3.	$.01	$.70	$.25	$2.68	$5.00
	.02	.15	.37	3.65	.09
	.04	.16	.89	7.08	37.65
				1.97	1.97





CLERKS COUNT CHANGE AND SO SHOULD WE



1. Mary bought a loaf of bread at the store for 13¢. She gave the clerk a half dollar. The picture at the right shows how he counted the change.

2. Arthur bought a dozen oranges for 34 cents. He gave John $1.00. John gave Arthur a penny, a nickel, a dime, and a half dollar. Count the change the way John should count it.

3. Alice bought a 3-cent candy bar and handed the clerk a quarter. The clerk gave her 2 pennies and 2 dimes. Count the change.

4. A boy spent 18 cents and gave the clerk $1.00. For change the clerk gave him 2 pennies, a nickel, a quarter, and a half dollar. How many coins was that? Count the change.

5. You buy something for 35 cents. You give the clerk a dollar. Name the coins to show how the clerk can count your change in the following ways:

(5¢) (?) (?)

(5¢) (?) (?) (?)

(?) (?) (?) (?) (?)

Breakfast

Breakfast Specials

No. 1. 20 cents

Orange Juice
Wheat Cakes
Coffee or Milk

No. 2. 35 cents

Tomato Juice
Two Eggs Toast
Coffee or Milk

Regular Prices

Fresh Peaches	15¢
Orange Juice	10¢
Tomato Juice	10¢
Milk	5¢
Coffee	5¢
Two Eggs	25¢
Toast	10¢
Wheat Cakes	15¢

DON ORDERS HIS BREAKFAST

Many restaurants serve "breakfast specials" at prices much less than if the regular prices are paid for each kind of food. Use the prices above to find the answers to the problems below.

1. Don orders Breakfast Special No. 1. How much change should he receive from a half dollar?

2. If he had bought each of the foods in the "Special" at the regular prices at the right, how much would his meal have cost? How much more is this than the special price?

3. How much less than the cost of the foods in Special No. 2 at the regular prices is the price of the "Special"?

4. At regular prices what would be the cost of a breakfast of fresh peaches, two eggs, toast, and milk? How much more is this than the price of Special No. 2?

5. How much would wheat cakes and milk cost at regular prices?

*6. Study the menus of your local restaurants and compare the prices of meals at special and at regular prices.

IMPROVING YOUR WORK IN SUBTRACTION

The Subtraction Combinations. Keep a record of your scores on three trials of this practice. Do extra practice on combinations you miss.

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*
1.	15	12	17	12	14	10	16	13	14
	8	4	9	7	5	9	9	5	6
2.	11	10	14	11	15	11	13	12	18
	7	2	7	2	9	8	6	8	9
3.	12	16	10	15	12	13	11	15	14
	6	7	5	7	9	8	9	6	8
4.	13	10	12	9	17	10	11	12	13
	7	8	5	3	8	6	4	3	9
5.	16	10	14	10	11	13	11	10	11
	8	4	9	3	6	4	3	7	5

Study Helps for Subtraction. Study these examples. Then copy and work them with your book closed. Check.

1. 75 − 24 = 51	2. 359 − 204 = 155	3. 860 − 250 = 610	4. 706 − 701 = 5
5. 8000 − 3000 = 5000	6. 72 − 36 = 36	7. 693 − 267 = 426	8. 314 − 243 = 71
9. 685 − 296 = 389	10. 4196 − 3958 = 238	11. 8216 − 5739 = 2477	12. 804 − 486 = 318
13. 9000 − 4005 = 4995	14. 7050 − 4948 = 2102	15. 9105 − 3050 = 6055	16. 6003 − 5994 = 9

MAGIC SQUARES AND CIRCLES

These are magic squares. The sums of the numbers in any row, column, or line in the square are the same. See if this is true of these squares.

1.

16	2	3	13
5	11	10	8
9	7	6	12
4	14	15	1

2.

21	7	8	18
10	16	15	13
14	12	11	17
9	19	20	6

Find the missing numbers in the squares below:

3.

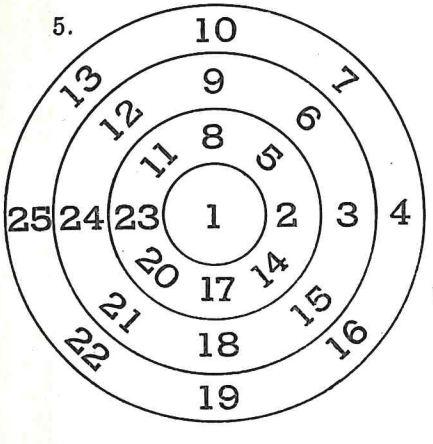
17	24	1	8	15
23	5	7	14	?
4	6	13	20	22
?	12	19	?	3
11	?	25	2	9

4.

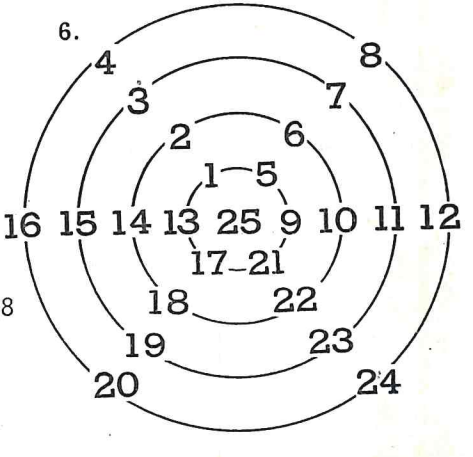
28	35	12	19	?
34	?	18	25	27
?	17	24	?	33
21	23	30	32	14
22	29	?	13	20

Show that these are magic circles. The sums of all the lines of figures should be the same.

5.



6.



FINDING YOUR DIFFICULTIES IN SUBTRACTION

Do not be satisfied until you can work all of the different kinds of examples correctly in less than the time allowed. Keep a record of your scores on three trials of each set to see how your work improves. Write on folded paper placed below the examples.

Set I

	a	*b*	*c*	*d*	*e*
1.	32	47	35	64	12
	21	2	5	34	12
2.	894	858	90	706	900
	362	204	20	602	300
3.	75	638	985	893	797
	72	631	983	93	17

Set II

1.	65	108	592	771	914
	48	36	358	584	846
2.	170	7797	7137	7385	7528
	2	5189	4528	6449	1839
3.	$1.33	$12.56	$.71	$13.21	$16.41
	1.08	2.99	.68	4.97	15.98

Set III

1.	80	800	500	909	802
	46	550	107	718	709
2.	7002	6030	9800	7067	8000
	1793	2059	7948	4073	2560
3.	$2.04	$1.20	$45.65	$13.73	$124.20
	.05	.60	17.76	7.05	66.75

ZERO WAS A GREAT INVENTION

Arabic	Roman
1	I
10	X
100	C
1000	M

The picture at the left shows how the Romans wrote the numbers: **one, ten, hundred,** and **thousand.**

1. How many places are there in the Arabic number 10? Are there as many places in the number as it was written by the Romans? What does the 0 in 10 show?

2. How many places are there in the number 100? 1000? How many places are there in these numbers as written by the Romans? What is the value of the 1 in 100? in 1000?

3. In the Roman system repeating a number repeats its value. Thus, CCII has the value of 202. What would be the value of the Arabic number 202 if the rule that a repeated number repeats its value was used?

4. You can see that in the Roman system 0 was not used. What do we mean when we say that the 0 is a place holder? What do the zeros in 1000 show?

5. You can see that there was no place value in the Roman system. MCXI was the Roman way of writing the number 1111. Which of the two ways do you think is simpler? Why?

The idea of place value in our number system makes it much easier to add and subtract numbers than to work with Roman numerals.

Arabic	Roman
72	LXXII
104	CIV
6	VI
1018	MXVIII

*6. First, work the addition example at the left using the Arabic numbers. Next, try to work the example by adding the Roman numerals. What difficulties do you have? Which way is simpler?

IMPROVING YOUR WORK IN MULTIPLICATION

The Multiplication Combinations. To see how your work improves, keep a record of your scores on three trials of this exercise. Do extra practice on combinations you miss more than once, or that seem to be difficult for you.

Set I

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*
1.	1	4	1	2	0	0	6	1	1	3
	6	2	7	1	7	3	1	5	2	3
2.	5	1	0	2	9	2	5	1	1	0
	1	8	2	3	1	6	2	1	4	9
3.	6	3	1	8	0	1	7	2	0	0
	3	2	9	1	4	3	2	4	5	6
4.	3	0	6	2	4	2	2	7	4	0
	1	8	2	5	1	2	7	1	3	1

Set II

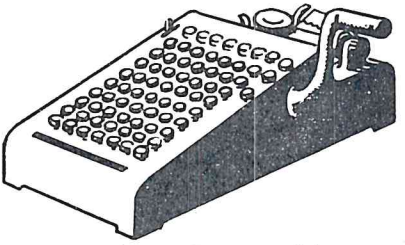
1.	5	7	3	5	3	7	6	3	4	3
	4	4	8	3	9	5	4	7	8	5
2.	8	6	2	2	8	9	5	8	9	5
	9	6	9	8	3	9	6	8	3	5
3.	8	4	6	7	3	4	4	7	9	8
	5	5	8	3	6	9	4	6	6	7
4.	6	3	7	2	5	9	7	5	7	9
	7	4	9	9	7	5	8	8	7	4
5.	6	8	4	8	9	8	6	4	9	5
	9	6	6	2	8	4	5	7	7	9

ADDING MACHINES DO NOT MAKE ERRORS

John bought this list of foods at the grocery store:

Things Bought	Clerk's Figures
2 cans corn at 14¢ a can	28¢
1 loaf bread at 13¢ a loaf	13¢
4 lb. tomatoes at 8¢ a pound	32¢
10 lb. sugar at 7¢ a pound	70¢
2 doz. cookies at 15¢ a dozen	30¢

1. The column at the right shows how the clerk figured the cost of each kind of food John bought. Were his figures correct? Why is it a good plan to check the arithmetic of a clerk?



2. To find the amount John should pay him, the clerk used an adding machine like the one shown at the right. The numbers he added and the sum is shown on the slip at the left. Show that the total is correct. Why is it not necessary to check the sum when several numbers are added on an adding machine? How does an adding machine work?

.28
.13
.32
.70
.30
.30

$2.03

3. John looked at the list. He said, "Something is wrong." Was the number of items the clerk had on the slip the same as the number of kinds of food John bought?

4. Compare the numbers given on the slip with the numbers given at the top of the page to see if they are the same. What mistake did the clerk make on John's slip?

Why is it a good idea to check both the number of items on the list and the correctness of the items listed?

BUT CLERKS SOMETIMES DO MAKE ERRORS

Pears, 24 cents a can	Butter, 37 cents a pound
Eggs, 36 cents a dozen	Milk, 13 cents a quart

Here are the prices of a number of things that are sold at Alman's store. Below are four sales slips made out by a clerk. Check them to see if he charged the correct prices or if he made any other errors.

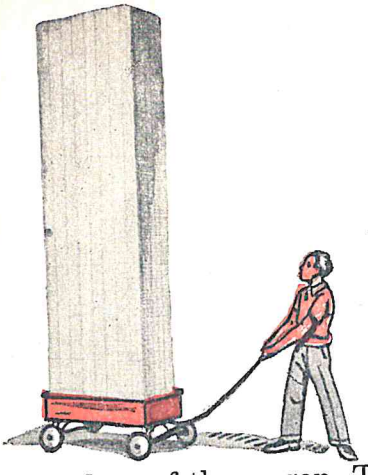
1. MRS. SMITH'S ORDER 3 cans pears $ .72 2 lb. butter .74 4 doz. eggs 1.44 $3.00	2. MRS. JONES'S ORDER $\frac{1}{2}$ doz. eggs $ .16 3 bottles milk .39 4 cans pears .96 $1.51
3. MRS. HOLMES'S ORDER 4 lb. butter $1.44 3 doz. eggs 1.08 5 cans pears 1.20 $3.72	4. MRS. BERTRAM'S ORDER 6 bottles milk $ .78 5 lb. butter 1.75 5 doz. eggs 1.80 $4.32

5. What mistakes did the clerk make on these sales slips?

6. On which orders was the total cost of the order too large? Who loses when the amount paid by the customer is too large, the customer or the owner of the store?

7. On which orders was the total cost of the order too small? Who loses when the amount paid is too small, the customer or the owner of the store?

*8. Check some sales slip or bill received at home to see if there are errors.



HOW MUCH IS A MILLION?

We write a **million** like this: 1,000,000.

Could you haul 1,000,000 one-dollar bills in a coaster wagon? A dollar bill is about 6 inches long and $2\frac{1}{2}$ inches wide. You could lay about 50 one-dollar bills side by side on the floor of the wagon. Then if you stacked one-dollar bills on each of the 50 until the 50 piles were 9 feet high, you would have about a million dollars.

To help us to read them, large numbers are divided by commas into groups, or periods, of three figures each, beginning at the right. Each period has its name. We read this number:

142,347,542

142 **million,** 347 **thousand,** 542.

Read these numbers:

1. 347,542 340,542 347,042 1,275,000
2. 1,400,000 5,500,000 15,050,500 110,645,542

If you had 1,000 coaster wagons full like the one above, you would have a billion dollars. A **billion** is written like this: 1,000,000,000. You can see that a billion has four periods. When a number has four periods, the fourth period from the right is billions. We read this number: 2 **billion,** 397 **million,** 717 **thousand,** 534.

2,397,717,534

3. Read these numbers:
   4,675,984,529 45,000,260,713 597,846,002,090

*4. Look in books and newspapers for large numbers such as these. Bring them to class and be ready to read them.

MORE PRACTICE IN MULTIPLICATION

Getting Ready to Carry in Multiplication. Write the answers on paper placed at the right of each column below. The answer to the first example is 13. Think: 2 sixes are 12, and 1 are 13.

	a	*b*	*c*	*d*
1.	$2\times6+1=13$	$8\times5+4=$	$8\times3+4=$	$4\times9+3=$
2.	$7\times6+5=$	$8\times8+7=$	$6\times7+4=$	$4\times4+3=$
3.	$7\times7+5=$	$8\times6+7=$	$5\times3+4=$	$6\times4+5=29$
4.	$7\times9+6=$	$3\times9+2=$	$5\times5+3=$	$9\times8+7=$
5.	$8\times7+6=$	$4\times6+3=$	$7\times3+6=$	$7\times4+5=$
6.	$8\times9+5=$	$7\times5+6=$	$8\times2+5=$	$6\times2+4=$
7.	$4\times5+3=$	$3\times6+2=$	$9\times5+6=$	$5\times4+4=$
8.	$9\times6+7=$	$6\times5+4=$	$4\times3+3=$	$9\times2+7=$
9.	$3\times8+2=$	$6\times3+5=$	$8\times4+5=$	$7\times2+5=$
10.	$9\times9+6=$	$4\times7+3=$	$9\times3+7=$	$6\times6+4=$

Study Helps For Multiplication. Study the first example in each row. Then work the other examples.

	a	*b*	*c*	*d*	*e*	*f*	*g*
1.	31	12	32	24	71	53	21
	$\times2$	$\times4$	$\times3$	$\times2$	$\times5$	$\times2$	$\times9$
	62						
2.	60	80	90	401	600	810	901
	$\times4$	$\times5$	$\times9$	$\times8$	$\times7$	$\times6$	$\times3$
	240						
3.	26	69	57	97	38	690	950
	$\times5$	$\times5$	$\times8$	$\times7$	$\times9$	$\times6$	$\times4$
	130						
4.	604	607	705	504	805	6009	7080
	$\times4$	$\times9$	$\times6$	$\times5$	$\times7$	$\times8$	$\times4$
	2416						

READING HELPS IN PROBLEM SOLVING

The question a problem asks is one of the most important parts of a problem. Let's look at the questions in the three problems below.

I. Henry had 25 cents. Kate had 5 cents. How many cents did they have together?

II. Henry had 25 cents. Kate had 5 cents. How many cents more than Kate had did Henry have?

III. Henry had 25 cents. Kate had 5 cents. How many times as much as Kate had did Henry have?

1. What two facts are given in each problem? Are the facts the same for each problem?

2. Read the question in each problem. Does each problem have a different question?

3. What numbers will you use to solve each problem?

4. What process will you use to solve problem I? problem II? problem III?

5. Tell how the question each problem asks helped you to decide the process to use to solve the problem.

You can see that the same two facts can be used to make an addition problem, a subtraction problem, and a division problem. The question the problem asks determines the process to use in solving it.

Make three problems about each set of facts below, using different questions. Let one of the three problems be solved by addition, one by subtraction, and one by division.

6. Jack is 18 years old. Betty is 6 years old.

7. Tom rode 40 miles on his bicycle. Alice rode 8 miles.

8. Butter costs 40 cents a pound. Lard costs 10 cents a pound.

*9. Write two problems in which the questions show that they must be solved by multiplication.

STUDY HELPS FOR MORE DIFFICULT MULTIPLICATION

Study the first example in each row. Then work the other examples.

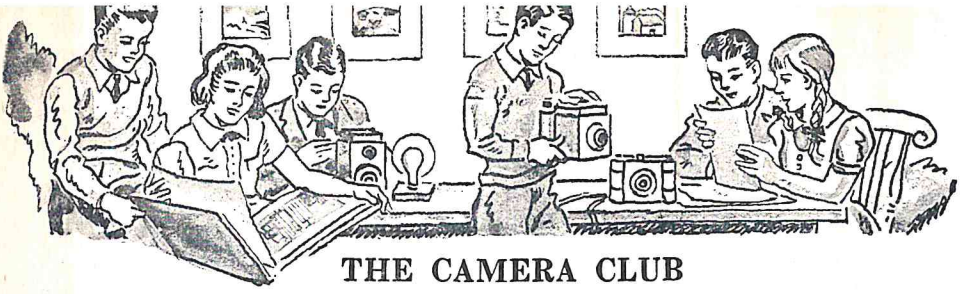
	a	*b*	*c*	*d*	*e*	*f*
1.	618 ×2 = 1236	416 × 4 =	914 × 6 =	819 × 2 =	827 × 3 =	312 × 7 =
2.	395 ×3 = 1185	238 × 8 =	394 × 7 =	435 × 9 =	483 × 6 =	527 × 9 =
3.	3495 ×7 = 24465	4129 × 9 =	3679 × 4 =	4796 × 2 =	5964 × 3 =	2386 × 8 =
4.	\$6.52 ×8 = \$52.16	\$3.27 × 5 =	\$4.95 × 8 =	\$7.48 × 7 =	\$6.89 × 5 =	\$6.58 × 9 =

FINDING DIFFICULTIES IN MULTIPLICATION

Do not be satisfied until you can work all of these different kinds of examples quickly and correctly. Find careless errors. Keep a record of your scores on three trials of each row of examples to see how your work improves.

	a	*b*	*c*	*d*	*e*	*f*
1.	21 × 4 =	40 × 2 =	91 × 7 =	312 × 2 =	\$8.23 × 3 =	\$6.25 × 3 =
2.	850 × 2 =	501 × 5 =	600 × 7 =	8010 × 9 =	\$80.06 × 8 =	\$4.38 × 4 =
3.	347 × 6 =	348 × 5 =	903 × 9 =	9070 × 8 =	\$70.04 × 9 =	\$59.80 × 6 =

Did you have any difficulty with zeros?



THE CAMERA CLUB

The Camera Club has earned 64 cents with which to buy reprints of a picture. How many pictures can they buy if each one costs 5 cents? How many cents will they have left?

THINK: $64¢ \div 5¢ = ?$ 64 is 6 tens and 4 ones.

The Steps in Division

1. DIVIDE: Think, "How many 5's in 6 in tens' place?" Write 1 above the 6 tens of 64.

Step 1

```
  1
5)64
 5x
 14
```

2. MULTIPLY: $5 \times 1 = 5$. Write 5 under the 6.
3. COMPARE: 5 is less than 6.
4. SUBTRACT: $6 - 5 = 1$. This is ten or 10 ones.
5. COMPARE: The remainder, 1, is less than the divisor, 5.
6. BRING DOWN the 4 ones of 64 to the 1 ten or 10 ones, making 14 ones. Show with an x the number brought down.

Step 2

```
 12 r4
5)64
 5x
 14
 10
  4
```

1. DIVIDE 14 ones by 5. Write 2 in ones' place above the 4 of 64, because you divided **ones.**
2. MULTIPLY 5×2. Write 10 under 14.
3. COMPARE: 10 is less than 14.
4. SUBTRACT: $14 - 10 = 4$. This is 4 ones.
5. COMPARE: 4 is less than 5, the divisor.
6. Because there are no more numbers to bring down, write the remainder, 4, in the quotient like this: **r4.**

The club can buy 12 pictures and will have 4 cents left.

IMPROVING YOUR WORK IN DIVISION

The Division Combinations. To see how your work improves, keep a record of the number of combinations you have correct on three trials of the exercise. Do extra practice on combinations you miss more than once.

Set I

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*
1.	$4\overline{)16}$	$9\overline{)18}$	$7\overline{)7}$	$5\overline{)10}$	$2\overline{)0}$	$3\overline{)3}$	$6\overline{)12}$	$8\overline{)32}$	$6\overline{)24}$
2.	$3\overline{)9}$	$5\overline{)25}$	$6\overline{)0}$	$8\overline{)16}$	$4\overline{)8}$	$8\overline{)8}$	$7\overline{)28}$	$2\overline{)12}$	$9\overline{)9}$
3.	$5\overline{)5}$	$2\overline{)2}$	$8\overline{)0}$	$3\overline{)12}$	$5\overline{)0}$	$7\overline{)21}$	$2\overline{)6}$	$9\overline{)0}$	$4\overline{)16}$
4.	$9\overline{)27}$	$3\overline{)0}$	$7\overline{)14}$	$5\overline{)20}$	$9\overline{)36}$	$4\overline{)12}$	$3\overline{)15}$	$8\overline{)24}$	$5\overline{)15}$
5.	$2\overline{)10}$	$6\overline{)18}$	$4\overline{)20}$	$2\overline{)4}$	$4\overline{)0}$	$2\overline{)8}$	$6\overline{)6}$	$3\overline{)6}$	$7\overline{)0}$

6. What is the quotient of any number divided by 1? $1\overline{)9} = ?$

Set II

1.	$8\overline{)48}$	$2\overline{)14}$	$8\overline{)64}$	$4\overline{)28}$	$7\overline{)49}$	$3\overline{)18}$	$5\overline{)30}$	$7\overline{)56}$	$9\overline{)45}$
2.	$3\overline{)27}$	$7\overline{)42}$	$9\overline{)72}$	$5\overline{)45}$	$5\overline{)35}$	$6\overline{)36}$	$8\overline{)56}$	$3\overline{)24}$	$6\overline{)30}$
3.	$6\overline{)48}$	$7\overline{)35}$	$6\overline{)54}$	$2\overline{)16}$	$9\overline{)81}$	$4\overline{)32}$	$8\overline{)72}$	$9\overline{)54}$	$4\overline{)24}$
4.	$1\overline{)1}$	$5\overline{)40}$	$3\overline{)21}$	$9\overline{)63}$	$4\overline{)36}$	$7\overline{)63}$	$6\overline{)42}$	$2\overline{)18}$	$8\overline{)40}$

Finding Part of a Number. To find $\frac{1}{4}$ of a number you must divide the number by 4. Thus, $\frac{1}{4}$ of $36 = 4\overline{)36.}$ ^{9}

Find:

1. $\frac{1}{2}$ of 16	4. $\frac{1}{4}$ of 20	7. $\frac{1}{8}$ of 72	10. $\frac{1}{9}$ of 27
2. $\frac{1}{3}$ of 15	5. $\frac{1}{5}$ of 35	8. $\frac{1}{9}$ of 54	11. $\frac{1}{7}$ of 56
3. $\frac{1}{6}$ of 36	6. $\frac{1}{7}$ of 35	9. $\frac{1}{8}$ of 64	12. $\frac{1}{6}$ of 54

STUDY HELPS FOR DIVISION

Practice in Even Division. Study the first example in each row below. Then work the other examples.

	a	*b*	*c*	*d*	*e*	*f*
1.	24 $2\overline{)48}$	$3\overline{)63}$	$2\overline{)62}$	$4\overline{)408}$	$8\overline{)880}$	$9\overline{)909}$
2.	91 $7\overline{)637}$	$4\overline{)164}$	$8\overline{)488}$	$6\overline{)426}$	$9\overline{)729}$	$5\overline{)405}$
3.	70 $4\overline{)280}$	$9\overline{)630}$	$8\overline{)560}$	$7\overline{)490}$	$6\overline{)300}$	$5\overline{)300}$
4.	304 $5\overline{)1520}$	$9\overline{)1881}$	$7\overline{)2842}$	$8\overline{)3216}$	$5\overline{)4510}$	$2\overline{)1814}$

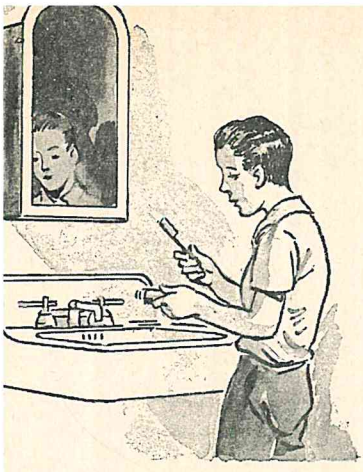
Uneven Division. Use the table below for practice in finding quotients with remainders.

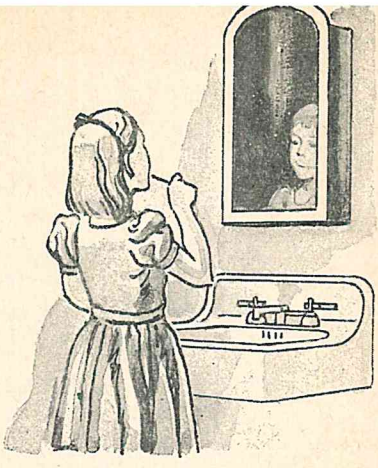
1. Divide the numbers in the first two columns by 2. Write out the work as shown in the box.

2. Divide the numbers in the first three columns by 3, in the first four columns by 4, and so on until you have divided by all numbers from 2 to 9.

$$\begin{array}{r} 4\text{ r}1 \\ 2\overline{)9} \\ \underline{8} \\ 1 \end{array}$$

9	14	26	38	46	55	64	79	84
0	17	24	33	44	59	61	74	87
5	12	20	37	40	50	68	72	83
2	10	25	31	49	54	63	76	80
4	15	23	34	43	56	60	71	85
1	16	21	30	45	51	67	75	82
6	11	28	36	41	58	65	78	89
3	18	27	39	47	53	62	70	86
7	13	29	32	42	52	69	73	81
8	19	22	35	48	57	66	77	88





TAKE CARE OF YOUR TEETH

1. Jane's mother sends her to the dentist twice a year to have her teeth cleaned. The dentist charges $1.75 each time. How much does it cost a year to have Jane's teeth cleaned?

2. After one of these visits the dentist told Jane, "You have three teeth with small cavities in them. I can fill them at $1.25 for each tooth." How much would it cost to have these teeth filled?

3. Jane's brother, Bobby, had four of his baby teeth filled for $3.00. How much did the dentist charge for each tooth?

4. Jane's mother bought 2 toothbrushes at 25 cents each, and 4 tubes of tooth paste at 19 cents a tube. How much did she spend in all for the tooth brushes and tooth paste?

5. Jane drinks a quart of milk a day. How much does the milk she drinks in a week cost at 12 cents a quart?

*6. Drinking milk helps us to build strong teeth. What other kinds of food help us to build strong teeth?

*7. What does your school do to help the children to protect their teeth?

DIFFERENT MEASURES FOR DIFFERENT THINGS

You have learned about many different kinds of measures. The measure we use depends upon what it is that we are measuring and how exactly we wish to measure it. The smaller the measure, the more exactly we can measure. We say that the ounce is a smaller **unit** of measure than the pound. What is a larger unit of measure than a pound?

1. Which of the words below is the name of a unit for measuring quantity? value? time? distance? weight? amount of liquid?

mile hour dime dozen gallon ounce

2. Read the following groups of units. Tell what each measures. Then arrange the units in each group in order of their size, placing the largest unit first. Be ready to give sentences showing how these units are used.

a. Rod, mile, inch, yard, foot
b. One, thousand, dozen, hundred, ten
c. Hour, week, day, second, year, minute, month
d. Dime, dollar, quarter, nickel, penny, half dollar
e. Quart, barrel, gallon, pint
f. Bushel, pint, quart, peck
g. Pound, ounce, ton

3. Tell what units we might use to measure each of these things and how we would measure them:

a. Butter, apples, milk, eggs, corn, oil, coal
b. The height of your classroom
c. The time to walk a block
d. The value of a candy bar
e. The weight of an egg
f. The water in a tank
g. The width of this book

4. What unit do we use in measuring temperature? Show with a thermometer that this unit is represented by a certain distance on the scale of the thermometer.

STUDY HELPS FOR UNEVEN DIVISION

Study the examples below until you are sure that you understand how they are worked. Then copy the examples and work them with your book closed. Check each example.

1. $3\overline{)87}$ → 29; 6^{x}; 27; 27
2. $4\overline{)79}$ → 19 r3; 4^{x}; 39; 36; 3
3. $4\overline{)348}$ → 87; 32^{x}; 28; 28
4. $5\overline{)397}$ → 79 r2; 35^{x}; 47; 45; 2
5. $3\overline{)2910}$ → 970; 27^{xx}; 21; 21; 0
6. $6\overline{)3629}$ → 604 r5; 36^{xx}; 29; 24; 5
7. $9\overline{)274}$ → 30 r4; 27^{x}; 4
8. $8\overline{)300}$ → 37 r4; 24^{x}; 60; 56; 4

Practice in Uneven Division. If you have difficulty with the examples in any row, study the example above having the same number as the row.

	a	*b*	*c*	*d*	*e*
1.	$3\overline{)84}$	$2\overline{)52}$	$6\overline{)90}$	$4\overline{)72}$	$2\overline{)98}$
2.	$5\overline{)79}$	$7\overline{)94}$	$3\overline{)50}$	$2\overline{)93}$	$4\overline{)97}$
3.	$4\overline{)304}$	$6\overline{)288}$	$7\overline{)651}$	$5\overline{)175}$	$8\overline{)424}$
4.	$6\overline{)497}$	$9\overline{)408}$	$8\overline{)547}$	$4\overline{)319}$	$3\overline{)299}$
5.	$7\overline{)2520}$	$3\overline{)2220}$	$4\overline{)1440}$	$6\overline{)1920}$	$8\overline{)5920}$
6.	$9\overline{)4560}$	$6\overline{)5447}$	$8\overline{)7245}$	$7\overline{)1449}$	$9\overline{)8150}$
7.	$8\overline{)485}$	$7\overline{)423}$	$5\overline{)204}$	$9\overline{)635}$	$4\overline{)323}$
8.	$8\overline{)5800}$	$6\overline{)2088}$	$9\overline{)5832}$	$7\overline{)5943}$	$5\overline{)4295}$

FACTS THAT ARE MISSING

1. How many inches are there in 5 feet?

Before you can find the answer to this question, you must know how many inches there are in one foot. There are 12 inches in one foot. So in 5 feet there are 5×12 inches, or 60 inches.

Use the tables at the back of this book to find any facts that you may need to know in order to find the answers to the following problems.

2. How many feet are there in 8 yards?
3. How many yards are there in 9 miles?
4. How many are 7 dozen oranges?
5. How many gallons are there in 28 quarts?
6. Are 9 pints more than 4 quarts?
7. How many ounces are there in 7 pounds?
8. How many pounds are there in 5 tons of coal?
9. An automobile went a mile in 38 seconds. How many seconds less than a minute was this?
10. An airplane flew 200 miles in 65 minutes. How many minutes more than an hour was this?
11. How many hours are there in a week?
12. How many cents are there in 6 quarters?
13. How many pounds do 7 barrels of flour weigh?
14. In most states a bushel of wheat or potatoes weighs 60 pounds. How much does a peck weigh?
15. Cream is often sold by $\frac{1}{2}$ pints. How many $\frac{1}{2}$ pints are there in 6 pints? in 3 quarts? in 2 gallons?

FINDING YOUR DIFFICULTIES IN DIVISION

Do not be satisfied until you can work all of these different kinds of examples quickly and correctly. Watch the zeros. Keep a record of your scores on three trials of the set of examples to see how your work improves.

	a	*b*	*c*	*d*	*e*
1.	$2\overline{)84}$	$3\overline{)960}$	$4\overline{)804}$	$7\overline{)700}$	$8\overline{)648}$
2.	$4\overline{)320}$	$6\overline{)1836}$	$5\overline{)200}$	$2\overline{)100}$	$9\overline{)4536}$
3.	$3\overline{)81}$	$5\overline{)78}$	$4\overline{)308}$	$6\overline{)592}$	$8\overline{)563}$
4.	$7\overline{)3220}$	$9\overline{)7287}$	$7\overline{)6514}$	$8\overline{)5000}$	$5\overline{)958}$

DO YOU KNOW THESE ABBREVIATIONS?

To save time and space we often use abbreviations, such as ft. for foot, in naming answers to questions. Copy the abbreviations below neatly on your paper. After the abbreviation write the word it stands for. The same abbreviation is used for one or more than one.

1. in.	5. $	9. yr.	13. ft.	17. 6′
2. qt.	6. min.	10. mi.	14. bu.	18. ¢
3. pk.	7. yd.	11. gal.	15. lb.	19. 7″
4. hr.	8. pt.	12. sec.	16. bbl.	20. oz.

Change the forms of the numbers below by writing on your paper the numbers that are missing.

21. 3 hr. = ? min.	27. 9 bu. = ? pk.
22. 5 gal. = ? qt.	28. 7 wk. = ? da.
23. 6 lb. = ? oz.	29. 6 pt. = ? qt.
24. 7 ft. = ? in.	30. 4 min. = ? sec.
25. 4 yr. = ? mo.	31. 16 qt. = ? gal.
26. 8 yd. = ? ft.	32. 2000 lb. = ? ton

FINDING THE PROCESS TO USE IN SOLVING PROBLEMS

To find the answer to a problem, you must add, subtract, multiply, or divide numbers. What part of the problem will help you to know the process to use? Read each of the problems below and then tell what process you should use to find the answer. How can you tell what process to use?

1. How do you find how much less one boy weighs than another if you know each boy's weight?

2. If you know the number of cows in each of two fields, how do you find the total number of cows?

3. How do you find the number of ounces there are in 8 pounds?

4. How do you find the cost of several yards of cloth if you know the price of one yard of it?

5. If you know the cost of several yards of cloth, how do you find the price of one yard?

6. How do you find the number of miles a train can go in an hour if you know how many miles it can go in 4 hours?

7. Arthur sold newspapers on several days. How do you find the total number of newspapers he sold?

8. How do you find $\frac{1}{4}$ of 20?

9. If you have some cents, how do you find how many more you must get to have a dollar?

10. If you know the number of pencils in a box, how do you find the number of pencils in several such boxes?

11. How can you find the number of weeks there are in a month if you know the number of days it has?

12. If you know how much a man earns an hour, how do you find how much he earns in a number of hours?

A QUICK WAY TO CHECK ANSWERS

George has found a quick way to tell if the answers to the examples he works are much too large or much too small. This is how he checked the example in addition given below.

7956
3174
4856
15986

First he thinks, 7956 is about 8000
3174 is about 3000
4856 is about 5000.
Then he adds the 8, 3, and 5 in thousands' place and gets 16 thousands, or 16000.
Then he adds the numbers and writes the sum:
Since 15986 is about 16000, he knows that his answer is not much too small or too large.

1. Use George's method to check these sums. Are any of them much too large? Are any of them much too small?

a.	*b.*	*c.*	*d.*
7956	9847	8975	5886
+5087	+2956	+6297	+3174
13043	14803	14272	9060

2. Tell quickly about what the sum of each of these numbers is. Then add them to see if your sum was about right.

a.	*b.*	*c.*	*d.*
3957	9856	8157	6858
+4198	+2975	+7056	+7193

3. First subtract these numbers. Then use George's method to check your answer.

a.	*b.*	*c.*	*d.*
9856	8964	9178	12075
−1127	−2973	−3954	−9867

4. Show that the products of 4×695 and of 4×700 are about the same.

5. Tell a quick way to check the product of $5 \times 719 = 3595$.

6. Show that the quotients of $3\overline{)1794}$ and $3\overline{)1800}$ are about the same.

ESTIMATING ANSWERS TO EXAMPLES

Many girls and boys can look over an example quickly, and without doing the work, tell what they think the answer will be. We call this **estimating the answer.** Then they work the example carefully and compare the answer they get with their estimated answer. When the two answers are quite different, they know that something may be wrong either in their work or in their estimating. If the two numbers are nearly the same, the answer is likely to be right.

After each example below there are three possible answers. Look over the first example quickly and then write on your paper the one of the three numbers after it that you think is nearest the correct answer to the example. Number the estimated answer. Then work the example to see if your estimate was correct. Do this for each example.

1. $3756 + 8420 + 3675 =$	11000; 14000; or 16000
2. $97865 - 46289 =$	30000; 50000; or 60000
3. $8 \times 397 =$	1000; 3000; or 5000
4. $15786 \div 9 =$	1800; 2500; or 4000
5. $78 + 976 + 6480 =$	7500; 8000; or 9000
6. $\$846.75 - \$275.00 =$	\$400; \$550; or \$650
7. $9 \times \$47.25 =$	\$400; \$300; or \$500
8. $27865 \div 5 =$	4500; 5500; or 6500
9. $\$8.75 + \$.96 + \$35.97 =$	\$45; \$100; or \$350
10. $7 \times 687 =$	5000; 500; or 45000
11. $9576 - 8695 =$	2000; 900; or 18000
12. $4976 \div 8 =$	620; 825; or 560

*13. How many of your estimates were correct?

*14. Estimate the answers to one of the sets of examples on page 41. Write your estimates on your paper. Then work the examples. How nearly right were your estimates?

ESTIMATING ANSWERS TO PROBLEMS

Under each problem there are four numbers. Read the problem carefully. Then decide which of the four numbers is nearest what you think the answer to the problem will be. Write this number on your paper. Then solve the problem. Compare the answer you get with your estimate. Was your estimate right?

1. John has saved $5.98, Arthur $7.65, and Jane $4.27. How much have the three children saved in all?

$8 $14 $17 $25

2. Last summer Jack's father raised 4,275 bushels of potatoes. This summer he raised 3,968 bushels. How many more bushels did he raise last summer than this summer?

700 bu. 300 bu. 500 bu. 100 bu.

3. Seven new school desks cost $30.03. How much was that a desk?

$4 $8 $3 $10

4. At a sale Mary's mother bought 6 dresses at $3.79 each. How much did the six dresses cost?

$15 $19 $23 $25

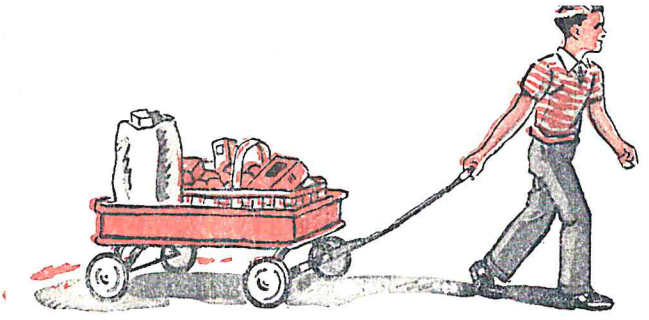
5. Jane has $7.28 in her bank. How much more must she put in the bank before it will contain $15.00?

$10 $20 $5 $8

6. At the school play Jack counted 108 men, 248 women, 79 boys, and 87 girls. How many people were there in all?

600 400 900 500

*7. How many of your estimates were correct?



EARNING MONEY BY BEING HELPFUL

Bobby has a wagon with which he sometimes helps people who have no automobiles to carry large orders of groceries home from the "Cash and Carry" store. They usually pay him for the help he gives them.

1. One day 7 people paid Bobby 10 cents each for helping them. Another man gave him a quarter. How much did Bobby receive in all?

2. One week Bobby received $1.60 in all from people he helped. James, another helper, received in all $.95. How much less did James receive than Bobby?

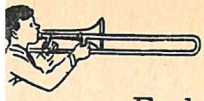
3. One busy week last summer Bobby received $.60 on Monday, $.50 on Tuesday, $.85 on Wednesday, $.79 on Thursday, $1.15 on Friday, and $1.36 on Saturday. How much did he receive in all?

4. When Bobby went on his vacation, he rented his wagon to his friend, Tommy, for $.60 a week. How much was that a day, counting 6 days as a working week?

5. One week Tommy received in all $2.10 from people he helped. How much did he have left after he paid Bobby for the use of his wagon?

6. During the 4 weeks Tommy used Bobby's wagon he received $6.40 from people he helped. How much did he have left after paying Bobby for his wagon?

*7. Tell ways in which boys and girls can earn money where you live.



LET'S PRACTICE

Each set of examples contains some of the kinds of examples you have reviewed. Work only one set of the examples a day. It is a good plan to check your work. Compare your scores for the two days. If you need more practice, repeat each set three times. Did your work improve?

Set I

1. 879 + 526 + 433 + 251 + 437 + 607

2. $8700 - 2600$

3. 406×4

4. $8316 - 5778$

5. 816×2

6. $9048 - 9018$

7. $4\overline{)827}$

8. $\frac{1}{2}$ of 16 =

9. 3495×6

10. $6\overline{)3625}$

Set II

1. 895 + 27 + 7742 + 580 + 26 + 630

2. $6930 - 2740$

3. 359×3

4. $\frac{1}{4}$ of 32 =

5. $3\overline{)840}$

6. $3127 - 2420$

7. 607×5

8. $7002 - 6993$

9. $\$5.84 \times 9$

10. $8\overline{)5000}$

USING THE VOCABULARY OF ARITHMETIC

Be ready to explain the meaning of each word, either with an example or by using it in a sentence.

sum	quotient	divisor	check
remainder	product	subtract	graph
difference	estimate	dividend	uneven
million	place value	billion	place holder
account	cash	balance	thrifty

HOW WELL DO YOU REMEMBER?

1. Which is more, a million or a billion?

2. Give the name of the place of each figure in the number 78,964.

3. What is the name of the answer in an addition example? in a subtraction example? in a multiplication example? in a division example?

4. Why is it a good plan to check your work?

5. Tell how to check the work in these examples:

a.	*b.*	*c.*	*d.*
27 48 65 140	9948 −8126 1822	974 ×8 7792	$5\overline{)37}$ 7 r2 35 2

6. How do we find $\frac{1}{2}$ of a number? $\frac{1}{2}$ of 30 = ?

7. Name two units of measure for each of the following: money value, time, distance, quantity, weight, and amount.

8. What questions should you ask yourself when you have this problem to solve:

Paul paid $1.60 for 5 pounds of butter. How much was the price of butter a pound?

9. What is a "graph"?

10. What is meant by "keeping an account"?

11. Tell what is meant by "estimating the answer."

12. Count the change as the clerk does it if you spend 37 cents for groceries and give the clerk a dollar bill.

13. Who makes out the sales slip at the store, the clerk or the customer?

14. How do we change hours to minutes? gallons to quarts?

15. Estimate the answer to this example, 9 × 1978. Then multiply to see if your estimate was about correct.

MEASURING YOUR ABILITY IN PROBLEM SOLVING

This problem scale will help you to find out how well you can solve arithmetic problems. Notice the meaning of your scores at the foot of the page.

1. In a classroom there were 8 rows of seats. In each row there were 6 seats. How many seats were there in all?
2. There were 150 oranges in one box and 128 oranges in another box. How many more oranges were there in one box than in the other?
3. How many eggs are there in 6 dozen?
4. At a sale Margaret's mother bought her a new dress for $8.75. The regular price of the dress was $12.50. How much did she save by buying the dress at the sale?
5. Mary's father paid $1.75 for 5 pounds of candy. How much did the candy cost a pound?
6. How much does $\frac{1}{2}$ pound of butter cost if butter costs 48 cents a pound?
7. Jack's father bought 8 gallons of gasoline at $.19 a gallon. How much did he spend for the gasoline?
8. Norman's father rents a garage for his automobile. He pays $5 a month for the garage. How much does he pay in one year?
9. How much does 1 quart of cream cost at 25 cents a pint?
10. John bought 3 loaves of bread at 13 cents a loaf and 2 cans of fruit at 25 cents a can. How much did he spend for the bread and fruit?

What Your Score Means

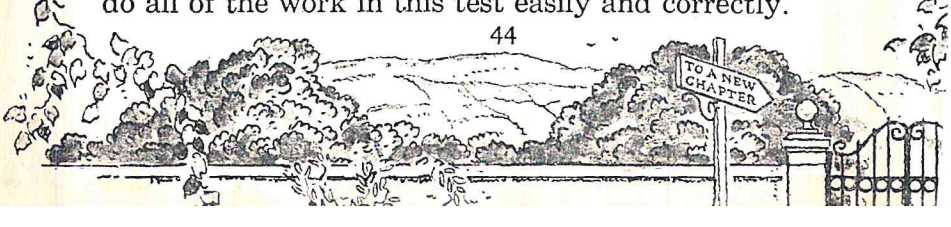
Unsatisfactory	Fair	Good	Excellent
0 1 2 3 4	5 6	7 8	9 10

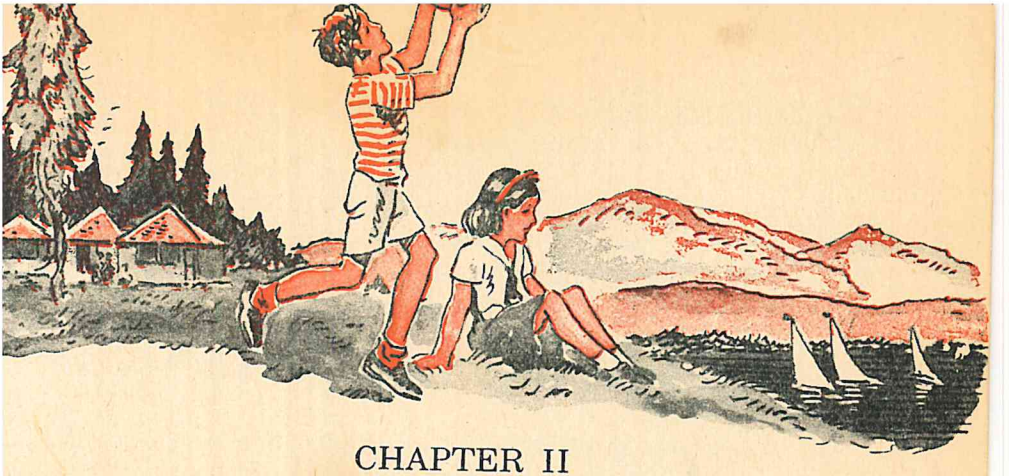
OPENING THE GATE TO THE NEW CHAPTER

This test will help you to find out how well you can work the different kinds of examples you have studied.

1. Find the sum of 3865, 278, and 19476. (14)
2. Write in words: 9,870,608,700. (24)
3. Write in figures: seven million four hundred twenty-eight. (24)
4. Subtract $38.75 from $87.21. (19)
5. Subtract 4275 from 9000. (17)
6. Multiply 384 by 6. (25)
7. Multiply 409 by 9. (25)
8. Multiply 301 by 8. (27)
9. Multiply 690 by 7. (27)
10. Divide 76 by 9. Check your answer. (29)
11. Divide 804 by 4. Check your answer. (30)
12. Divide 918 by 3. (30)
13. Divide 81 by 3. (33)
14. Divide 976 by 4. Check your answer. (33)
15. Divide 3864 by 6. Check your answer. (33)
16. Divide 254 by 5. (33)
17. Find $\frac{1}{3}$ of 27. (29)
18. How many feet are there in 9 yards? (32)
19. How many gallons are there in 12 quarts? (32)
20. Name the smallest units you have learned for measuring time, distance, and weight. (32)

After your paper has been marked, study and do again any examples you worked incorrectly. Turn for help to the pages given at the right. Do not be satisfied until you can do all of the work in this test easily and correctly.





CHAPTER II

SAVING MONEY FOR SUMMER CAMP

John and Alice save money to help pay their expenses at summer camp. John saves dimes. Alice saves nickels.

1. One week John put 5 dimes into his dime bank. How many cents was that?

   THINK: 5 dimes = 5 tens. Show by counting by tens that 5 tens are 50.
   John put 50 cents into the dime bank.

2. How many cents are 6 dimes? 8 dimes? 4 dimes?
3. Alice has saved 10 nickels. How many cents is this?

   THINK: 10 × 5 is the same as 5 × 10.
   1 ten × 5 is the same as 5 × 1 ten, or 5 tens.
   Alice has saved (?) cents.

4. How many cents are there in 12 dimes?

   THINK: 12 tens = ? Count by tens to find out.

5. How many cents are there in 10 dimes? in 20 dimes?
6. How many dimes are there in 70 cents?

   THINK: 70 is how many tens?

7. How many tens are there in 60? in 40? in 90?

*8. Have any of you deposited money in a savings bank? If so, tell how this is done. Tell why you are saving your money.

READINESS TEST FOR MULTIPLICATION WITH TWO FIGURES

Before you begin the new work in multiplying by two-figure numbers, it is important that you know very well how to multiply by one-figure numbers. Do not begin the next work until you are sure that you can work every example below correctly.

I. Repeat the practice on the multiplication facts on page 21.

II. Work the multiplication examples below. Go over your work to check it.

	a	*b*	*c*	*d*	*e*	*f*
1.	21	25	71	586	$1.97	$7.12
	× 4	× 3	× 5	× 2	× 6	× 8
2.	340	701	500	4030	$9.05	$84.00
	× 2	× 9	× 7	× 8	× 9	× 6

III. Find the sums:

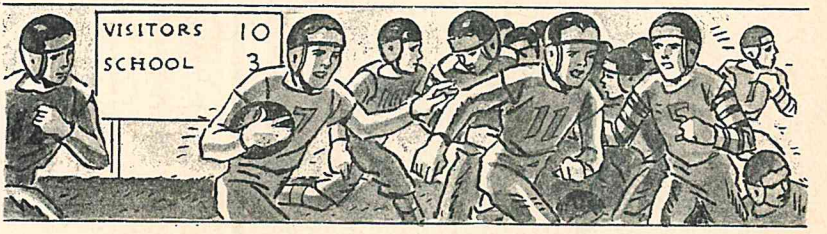
1. 86	2. 93	3. 186	4. 180	5. 675
+ 720	+ 2480	+ 620	+ 3600	+ 750

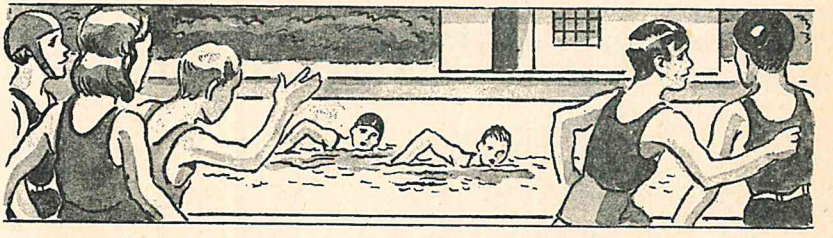
IV. Using Addition Instead of Multiplication

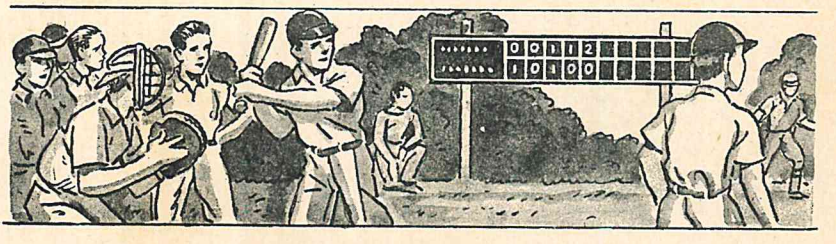
1. How much is 3×75? $75 + 75 + 75 = ?$
2. How can you use addition to find 10×25? 20×15?
3. Find 6×375 by multiplication and by addition.

V. Place Values in Numbers

1. Tell what each figure in the number 7,528 stands for.
2. Write with figures: eight thousands; four tens; seven tens; six hundreds; eight ones; fourteen tens; fifteen ones.
3. Write the value of 4 in each of the numbers below:
   a. 2400 *b*. 648 *c*. 234 *d*. 4176
4. How many tens are there in 240? How many ones?







*ARITHMETIC IN SPORTS

Make a list of all the ways arithmetic is used in the sports shown in these pictures.

20

MULTIPLYING BY TEN

1. How much do 5 loaves of bread cost at 10 cents each?
THINK: $5 \times 10¢ = 50¢$. Five tens = ?

2. Count by 5's to 50. How much is 10×5? You can see that $10 \times 5 = 50$. Does $5 \times 10 = 50$?

3. Count by 4's to 40. How much are 10 fours? You can see that $10 \times 4 = 40$. Four 10's = ?

4. Show that 30 is equal to 10×3. Three 10's = ?

5. Write 3 on your paper. Now write a 0 after the 3. This gives the number 30. Count to find how many 3's there are in 30.

You can see that writing a 0 after the 3 is the same as multiplying 3 by 10. $10 \times 3 = 30$. Does $10 \times 6 = 60$?

To multiply a whole number by 10, write 0 after the number. Thus, $10 \times 5 = 50$. $10 \times 12 = 120$.

Give the products:

6. $10 \times 2 =$ 9. $10 \times 1 =$ 12. $10 \times 15 =$ 15. $10 \times 80 =$
7. $10 \times 9 =$ 10. $10 \times 7 =$ 13. $10 \times 27 =$ 16. $10 \times 95 =$
8. $10 \times 8 =$ 11. $10 \times 6 =$ 14. $10 \times 46 =$ 17. $10 \times 70 =$

18. The example 10×2 means 1 ten $\times$ 2, which is 2 tens, or 20 ones. The example 10×15 means 1 ten $\times$ 15, which is 15 tens, or 150 ones. Find the products of examples 7 to 17 in this way.

19 How many ones are 4 tens? 6 tens? 9 tens? 15 tens? 23 tens? 45 tens? 50 tens? 91 tens?

20. How many tens are there in 30? 50? 70? 80? 100?

REMEMBER: When you multiply a number by 10, the product is that number with a 0 written after it.

*21. Show that $4 \times 30 = 4 \times 3 \times 10$.

MULTIPLYING BY TWO-PLACE NUMBERS ENDING IN 0

1. In an orchard there were 30 rows of trees with 12 trees in each row. How many trees were there in the orchard?

THINK: 30 × 12 = 3 tens × 12 = 36 tens = 360

A quick way to work this example is shown at the left. There is no number in ones' place to multiply by. So write 0 in the product in ones' place to show that you are multiplying not by ones, but by tens. (See A) Zero is a place holder for ones' place here. Now multiply 12 by 3. This gives 36. Write 36 before the 0. (See B) There are 360 trees in the orchard.

A	12
	×30
	0

B	12
	×30
	360

2. Study the examples below carefully. Explain each product. Then copy the examples and work them with your book closed.

a.	*b.*	*c.*	*d.*
72	42	36	30
×30	×20	×50	×40
2160	840	1800	1200

Find the products:

	a	*b*	*c*	*d*	*e*	*f*
3.	27	80	97	72	53	84
	×30	×50	×90	×40	×50	×40
4.	47	59	36	80	86	90
	×50	×40	×30	×60	×80	×30
5.	63	59	69	48	29	87
	×40	×60	×70	×30	×50	×70
6.	92	60	35	68	74	79
	×60	×50	×60	×90	×60	×80

7. A dealer bought 30 boxes of golf balls. In each box there were 24 balls. How many balls did he buy in all?

WHAT ARE THE MISSING SIGNS?

Copy the numbers below on your paper. Put in the missing signs. Is $-$ the correct sign in the first example?

1. $9 \; ? \; 6 = 3$
2. $8 \; ? \; 7 = 15$
3. $28 \; ? \; 4 = 7$
4. $16 \; ? \; 2 = 32$
5. $12 \; ? \; 3 = 9$
6. $16 \; ? \; 14 = 30$
7. $12 \; ? \; 10 = 120$
8. $29 \; ? \; 16 = 13$
9. $81 \; ? \; 9 = 9$
10. $15 \; ? \; 8 = 120$
11. $27 \; ? \; 9 = 36$
12. $48 \; ? \; 4 = 12$
13. $12 \; ? \; 16 = 28$
14. $7 \; ? \; 38 = 266$
15. $270 \; ? \; 9 = 30$
16. $320 \; ? \; 147 = 173$
17. $75 \; ? \; 46 = 121$
18. $469 \; ? \; 7 = 67$
19. $49 \; ? \; 8 = 392$
20. $247 \; ? \; 51 = 298$
21. $546 \; ? \; 273 = 273$
22. $20 \; ? \; 37 = 740$
23. $960 \; ? \; 3 = 320$
24. $68 \; ? \; 4 = 64$

ARTHUR'S WAY OF MULTIPLYING 12 BY 30

$$\begin{array}{r} 12 \\ \times 10 \\ \hline 120 \\ \times 3 \\ \hline 360 \end{array}$$

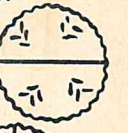
1. Here is how Arthur worked the example 30×12. He said, "30 is the same as 10×3. So to multiply 12 by 30, first I multiply 12 by 10. This gives 120. Then I multiply 120 by 3. This gives 360." Show by the method you learned on page 49 that $30 \times 12 = 360$.

2. Use Arthur's method to multiply 25 by 30; 46 by 50; 78 by 90.

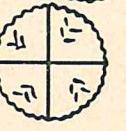
3. Write the number six. Now write a zero after the six. Now read the number. To how many times itself has the six been increased? What happens to any whole number when you write a 0 after it?

HELEN CUTS A CHERRY PIE

Helen baked a cherry pie for supper. She wanted to cut it into 8 equal pieces. This is the way she cut the pie.

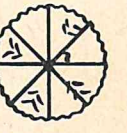


1. First she cut the pie into two equal pieces. What part of the pie was each piece? Write one half with figures.



2. Next she cut the pie crosswise, like this: What part of the pie was each piece?

3. How many fourths of a pie are there in half a pie? in a whole pie?



4. Then Helen cut each fourth of the pie into two equal parts. How many pieces were there then? What part of the pie was each piece? How many eighths are there in $\frac{1}{4}$ of the pie? in $\frac{1}{2}$ of the pie?

Parts of wholes like $\frac{1}{2}$, $\frac{1}{4}$ or $\frac{1}{8}$ are called fractional parts.

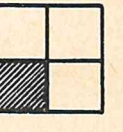
5. Which is more, $\frac{1}{2}$ of the pie or $\frac{1}{4}$ of the pie?

6. Which is less, $\frac{1}{4}$ of the pie or $\frac{1}{8}$ of the pie?

7. Which is most, $\frac{1}{2}$, $\frac{1}{4}$, or $\frac{1}{8}$ of a pie?

8. Which is least, $\frac{1}{2}$, $\frac{1}{4}$, or $\frac{1}{8}$ of a pie?

9. What part of the circle at the right is shaded? What part is not shaded?



10. What part of the square at the right is shaded? What part is not shaded?

11. Draw a square and shade $\frac{1}{2}$ of it.

12. Draw a circle and shade $\frac{1}{4}$ of it.

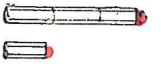
13. Draw another circle and shade $\frac{3}{8}$ of it.

14. How many halves are there in a whole? How many fourths? How many eighths?

USING FRACTIONS TO COMPARE THINGS

Here are two candy bars. It would take two pieces like the short one to make a bar as long as the long one. We say that the short bar is one half as long as the long bar, or is equal to half of it.

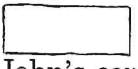
1. Show that the short crayon at the right is one third as long as the long one.



Study the drawings below, then tell in each case what part the short one is of the long one.

2.

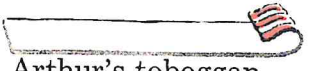
Fred's card



John's card

3.

Jack's sled



Arthur's toboggan

4.

Joe's pencil

Ann's pencil

5.

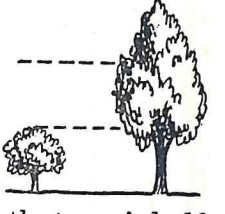
James' pennant

Ann's pennant

6. With your ruler draw a line 1 inch long. Below it draw a line 6 inches long. The top line is equal to what part of the bottom line?

7. Draw two lines so that one line will be one fourth as long as the other.

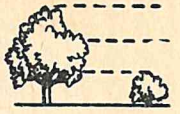
8. In the picture at the right there are a short tree and a tall tree. The short tree is (?) as high as the tall tree.

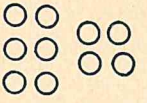


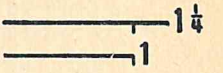
9. Draw a picture of two flagpoles showing that one is half as tall as the other.

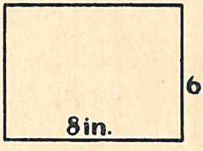
MAKING PROBLEMS ABOUT PICTURES

Each picture below tells an arithmetic story. Who can write the best problem about each picture?

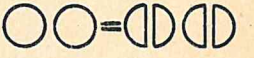
1. 

2. 

3. 

4. 

5.

6. 

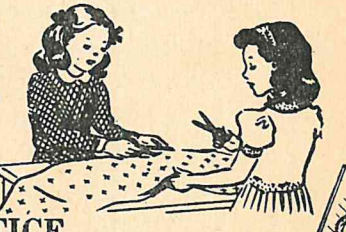
7.

8.

9.

10.

11.

12. 

LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	6070 − 1564	796 × 8	$\frac{1}{2}$ of 48 =	$6\overline{)79}$	45 × 10
2.	$\frac{1}{4}$ of 72 =	\$68.75 + 51.25	20 × 10	\$37.80 − 19.56	$5\overline{)\$7.85}$
3.	1486 − 79	8070 × 4	$8\overline{)963}$	628 × 10	6008 × 5

4. \$7.85 + \$96.18 + \$.60 + \$.08 = ?

READING HELPS IN PROBLEM SOLVING

Read each problem carefully. Tell:

a. What the problem asks you to find.
b. What facts you must know to answer the question.
c. What facts the problem contains that will help you find the answer. Are the facts you need stated exactly as you need them?
d. How you will solve the problem.
e. Your estimate of about what the answer is.

1. John's father owns 65 sheep, 48 cows, 74 pigs, and 15 horses. How many animals does he own?

2. Each person in America uses about 88 pounds of sugar a year. How much is that for a family of 6 people?

3. In the Jordan school there are 948 children. Of them, 469 are boys. How many girls are there?

4. A fast train travels a distance of 406 miles in 7 hours. How many miles does it go in an hour?

5. A good worker can pick about 275 pounds of cotton a day. How many pounds can he pick in 6 days?

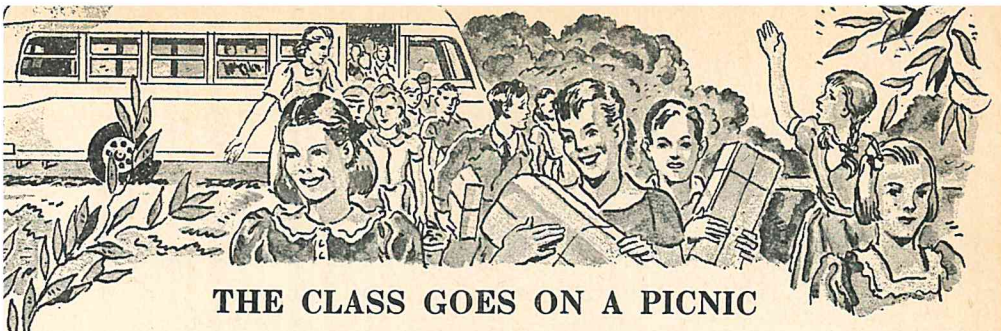
6. Molly-O, a prize cow, produced 329 pounds of milk in a week. How much did she produce a day?

7. On Monday Ada read 37 pages, on Tuesday 43 pages, on Wednesday 36 pages, and on Friday 29 pages. How many pages did she read in all?

8. The Watson family drove from Minneapolis to Los Angeles, a distance of 2,300 miles, in 5 days. How many miles did they go a day?

9. John counted 48 people on a street car. If each one paid 8 cents to ride, how much did they pay in all?

10. Peter has saved $9.87. How much more money must he have before he can buy the bicycle that costs $21.75?



THE CLASS GOES ON A PICNIC

1. The bus fare to the picnic grounds is $.25 for each pupil. If 30 pupils are going, how much will they pay the bus driver in all?

$ .25 ×30 $7.50	THINK: 30 × $.25 = ? First multiply 25 × 30. Then write in the decimal point to show dollars and cents in the answer. The 30 children will pay in all $7.50 for the bus.

2. Are all the products below correct?

a.	*b.*	*c.*	*d.*
$.35 ×20 $7.00	$.50 ×30 $15.00	$.15 ×40 $6.00	$.48 ×40 $19.20

3. Elsa is sick and can not go to the picnic. So each of the 30 children brought a dime for flowers. How much can they spend for the flowers?

Multiply:

	a	*b*	*c*	*d*	*e*	*f*
4.	$.21 ×20	$.94 ×30	$.19 ×10	$.47 ×40	$.74 ×50	$.63 ×20
5.	$.60 ×40	$.87 ×90	$.47 ×20	$.94 ×90	$.96 ×60	$.30 ×10
6.	$.59 ×20	$.28 ×10	$.95 ×70	$.89 ×40	$.80 ×20	$.86 ×30

*THE UNITED STATES AND THE WORLD

How do the important products of the United States and of the rest of the world compare? In the table below, you may read the figures for a certain year. Use the table to find the answers to the questions given below it.

	United States	Rest of World
a. Coal	482,000,000 tons	796,000,000 tons
b. Pig Iron	31,600,000 tons	47,400,000 tons
c. Oil	898,000,000 bbl.	521,000,000 bbl.
d. Wheat	851,000,000 bu.	4,033,000,000 bu.
e. Corn	2,081,000,000 bu.	1,935,000,000 bu.
f. Cotton	13,962,000 bales	11,538,000 bales
g. Automobiles Owned	26,697,000	9,108,000

1. Find the things of which the United States produced more than the rest of the world.

2. Find the things of which the United States produced less than the rest of the world.

3. How much more oil did the United States produce than was produced in the rest of the world? How much more cotton? How many more automobiles did we own?

4. How much less coal did the United States produce than was produced in the rest of the world? How much less wheat? How much less pig iron?

5. Did the rest of the world produce more than five times as much wheat as the United States produced?

6. Would it be correct to say that the United States produced about three times as much oil as was produced in the rest of the world? Prove your answer.

*7. Which of the products listed in the table is most necessary in the operation of automobiles? Did we produce as much of it as the rest of the world produced?

FIELD DAY AT THE JORDAN SCHOOL

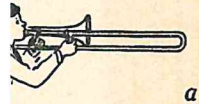
1. The children in the Jordan School held a Field Day to raise money to buy books for the school library. Here is a list of the tickets that were sold. Which room sold the largest number of tickets?

Room	Tickets Sold
1	30
2	10
3	40
4	20
5	50

2. How many more tickets did Room 5 sell than Room 2?

3. The tickets were sold for $.25 each. How much money was received for the tickets sold by Room 1? by Room 2? by Room 3? by Room 4? by Room 5?

4. How much was received in all for the tickets sold?



LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	7895 − 6998	$4\overline{)360}$	28 × 10	65 × 50	$\frac{1}{2}$ of 80 =
2.	$9\overline{)810}$	30 × 40	$5\overline{)375}$	$88.70 − 29.81	$.54 × 60
3.	$8\overline{)4872}$	$\frac{1}{4}$ of 72 =	$.38 × 10	$6\overline{)545}$	90000 − 10820

4. Find the sum of $3.75, $.86, $93.42, and $.07.

HOW TO FIND AVERAGES

1. Jane is reading an interesting book. The first hour she read 16 pages, the second hour 17 pages, the third hour 17 pages, and the fourth hour 18 pages. How many pages did she read in the four hours?

2. If she read 68 pages in the four hours, how many pages did she read an hour?

THINK: $68 \div 4 = ?$

We say that Jane read on the **average** 17 pages an hour. This means that the total number of pages she read in the four hours, 68 pages, was as many as though she had read 17 pages in each of the four hours.

3. Arthur read 31 pages on Monday, 28 pages on Tuesday, and 40 pages on Thursday. How many pages did he read in all? How many pages did he average a day?

To find the average of several numbers, find their sum and then divide the sum by the number of numbers you added.

4. Did Arthur read exactly the average number of pages on any of the days? Explain your answer.

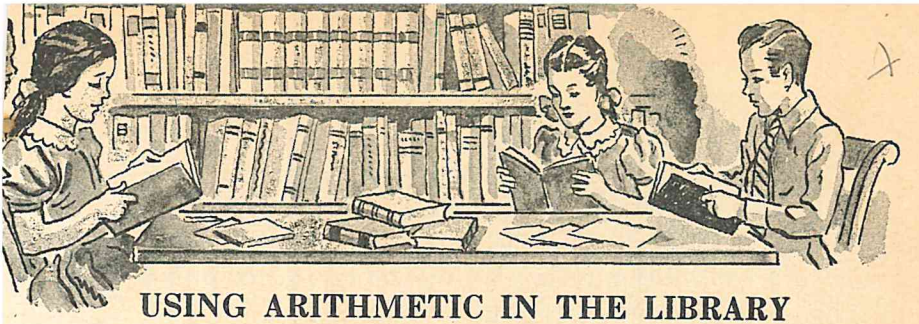
5. On what days did Arthur read more than the average number of pages? On what days did he read less than the average number of pages?

6. Jane's marks in four spelling tests were 88, 92, 100, and 92. Find her average mark.

7. A farmer boy had three calves weighing 120 pounds, 144 pounds, and 150 pounds. Find their average weight.

8. On a 4-hour hike a Boy Scout troop walked 8 miles. How many miles did they average an hour? Do you think that they walked the average number of miles each hour?

To find the average, divide the total distance by the number of hours.



USING ARITHMETIC IN THE LIBRARY

1. In the school library there were 278 story books, 180 social studies books, 65 reference books, and 467 other books. How many books were there in all? How many books are there in your school library or public library?

2. Alice reported that she read a book of 216 pages in 8 hours. How many pages did she read on the average an hour? Find how long it takes you to read some book and the average number of pages you read an hour.

3. John read a story containing 1,025 words in 5 minutes. How many words did he read on the average a minute? Can you read as rapidly as he did?

4. One month Anna read 28 books. Arthur read only 2 books that month. How many times as many books as Arthur read did Anna read? How many books do you read a month?

5. If a pupil reads on the average 10 books in a month, how many books does he read in a year?

6. In the library there was a set of reference books that cost $29.60. There were 8 books in the set. Find the cost of one book. Find the cost of some reference books in your library or schoolroom.

*7. Each child at the school had a library card with a number on it. Why do library cards have numbers?

*8. In public libraries, books are given numbers to help us to classify them and to locate them on the shelves. Can you explain how this is done?

MULTIPLYING BY TWO-PLACE NUMBERS

1. There are 24 cans of tomato juice in one box. How many cans of tomato juice are there in 23 boxes?

THINK: $23 \times 24 = ?$

Here you must multiply 24 by the two-place number 23. This is how John worked it.

He said, "23 is 20 + 3, or 3 ones + 2 tens. To multiply 24 by 23, I must first find 3 ones × 24; then 2 tens × 24. Then I must add the two products."

Here is his work:

(*a*) 3 ones × 24 = 72 ones, or 72
(*b*) 2 tens × 24 = 48 tens, or 480
(*c*) 480 + 72 = 552, the number of cans of tomato juice.

2. John's father taught him the shorter way to work the example shown below.

$$\begin{array}{r} 24 \\ \times 23 \\ \hline 72 \\ 480 \\ \hline 552 \end{array} \quad \begin{array}{l} (3 \times 24) \\ (20 \times 24) \end{array}$$

First multiply 24 by 3. This gives 72. Then multiply 24 by 20. This gives 480. See how the 480 is written. Then add 72 and 480. This gives 552.

The numbers 72 and 480 are called the **partial products because they are parts of the product.** Why is this a good name for them?

3. Study the work below carefully. Explain each step. Then copy the examples without the work and solve them with your book closed.

a.	*b.*	*c.*	*d.*	*e.*
34	42	35	16	$.38
×12	×21	×26	×59	×25
68	42	210	144	190
340	840	700	800	760
408	882	910	944	$9.50

CHECKING TWO-PLACE MULTIPLICATION

1. How many eggs are there in 24 dozen?
THINK: $12 \times 24 = ?$

A. The Work	B. The Check
24	12
×12	×24
48	48
240	240
288	288

Explain the work in Box A.

To check the work, change the places of the numbers 12 and 24 and multiply as in Box B.

Are the two products the same? There are 288 eggs in 24 dozen.

2. Another way to check the work is to go over it again. Which of these two ways do you think is the better?

Multiply and check:

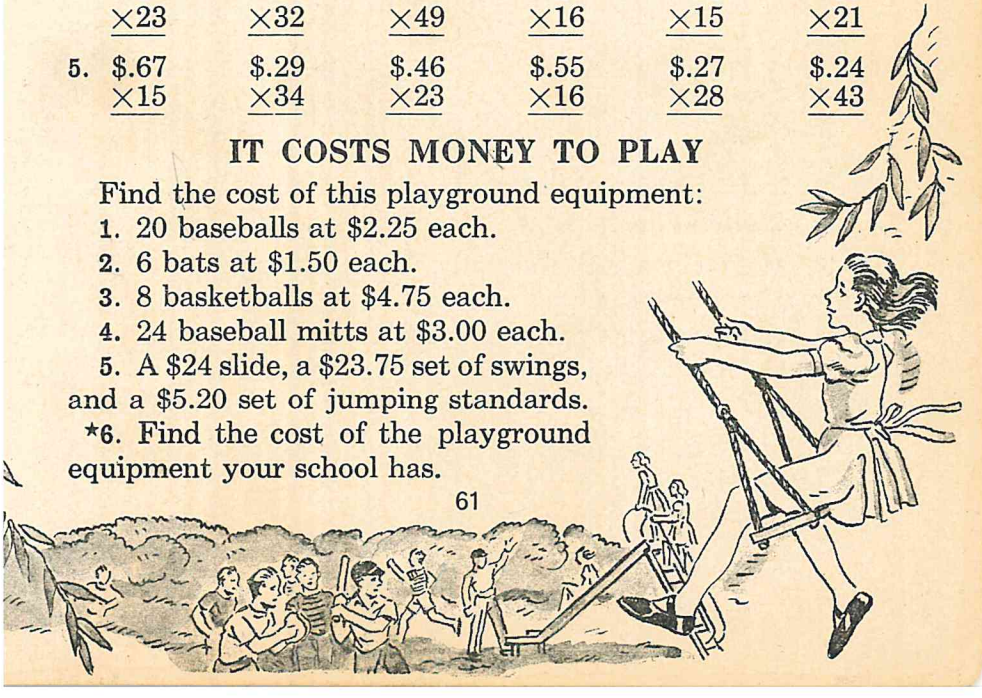
	a	*b*	*c*	*d*	*e*	*f*
3.	42 ×14	23 ×14	13 ×76	24 ×36	21 ×14	28 ×37
4.	37 ×23	23 ×32	12 ×49	47 ×16	58 ×15	39 ×21
5.	\$.67 ×15	\$.29 ×34	\$.46 ×23	\$.55 ×16	\$.27 ×28	\$.24 ×43

IT COSTS MONEY TO PLAY

Find the cost of this playground equipment:

1. 20 baseballs at \$2.25 each.
2. 6 bats at \$1.50 each.
3. 8 basketballs at \$4.75 each.
4. 24 baseball mitts at \$3.00 each.
5. A \$24 slide, a \$23.75 set of swings, and a \$5.20 set of jumping standards.

*6. Find the cost of the playground equipment your school has.



TWO QUESTIONS—ONE PROBLEM

These problems have two questions. You must find the answer to the first question before you can answer the second question.

1. Arthur bought 20 cans of pears at $.26 a can and a loaf of bread for 14 cents.
   a. How much did the pears cost?
   b. How much did the pears and bread cost?

2. Three pounds of lard cost 57 cents.
   a. How much does 1 pound of lard cost?
   b. How much do 9 pounds of lard cost?

3. Joe bought a ball for $1.25 and a bat for $.75.
   a. How much did the ball and bat cost in all?
   b. How much change should Joe receive from a $5 bill?

4. Alice walked to the lake in 23 minutes and home again in 19 minutes.
   a. How long did it take her to walk to and from the lake?
   b. How much less than an hour did it take her?

5. A clerk sold 38 red pencils and 27 black pencils.
   a. How many pencils did he sell in all?
   b. At 5 cents each how much did he receive in all for the pencils?

6. Mary cut a piece of cloth 27 inches long from a piece of cloth 50 inches long.
   a. How long was the piece of cloth that was left?
   b. How much less than a yard long was the piece that was left?

*7. Make up an interesting problem of your own like one of those given above.

READING HELPS IN PROBLEM SOLVING

1. We can change a problem with two questions so that it will contain only one question. Study the work below.

John sold 6 morning papers and 7 evening papers at 5 cents each.

a. How many papers did he sell?

b. How much did he receive in all for the papers?

The important question is *b*, but in order to find the answer to *b* you must first find the answer to question *a*. Solve this problem.

We can write the problem in a shorter way with only one question, like this:

John sold 6 morning papers and 7 evening papers at 5 cents each. How much did he receive in all for the papers?

You can see that only the important question *b* is asked in this problem. But we have seen that we cannot find the answer to question *b* until we first find the answer to question *a*. We have hidden question *a* without changing the work we must do to solve the problem.

2. Tell what the hidden question is in this problem:

Jane practices her music lesson 15 minutes each morning and 25 minutes each afternoon. How many minutes does she practice in 5 days?

3. Rewrite problem 2 showing questions *a* and *b*. Then solve the problem.

STUDYING TWO-STEP PROBLEMS

Rewrite the following problems, hiding question *a* in each problem as was done in problem 1 on page 63. Then solve the problems.

1. Joan paid 15 cents for a notebook and 25 cents for some paper. She gave the clerk 50 cents.

   a. How much did Joan spend?

   b. How much change should Joan receive?

2. Keith picked 6 bouquets of flowers. He gave 3 bouquets to some friends and sold the rest of them at 25 cents each.

   a. How many bouquets did he sell?

   b. How much did he receive for them?

3. Dick bought 10 pencils for 5 cents each and a tablet for 10 cents.

   a. How much did he spend for the pencils?

   b. How much did he spend for the pencils and tablet?

In each of the following questions find the hidden question. Write it and name it *a*. Write the question the problem asks and name it *b*. Then solve the problem.

4. Betty had 25 cents. She paid for 2 candy bars which cost 5 cents each. How much money did she have left?

5. Arthur wants to buy an airplane costing 75 cents and a kite costing 45 cents. He has only 65 cents. How much more money must he have before he can buy the airplane and the kite?

6. Helen had a piece of ribbon 48 inches long. She cut off a piece 30 inches long. How many inches less than a yard long was the piece that was left?

*7. Make up three problems of your own containing hidden questions.

WATCHING ADDITION IN MULTIPLICATION

1. Mr. Jones picked 32 boxes of apples from a large tree in his orchard. Each box of apples weighed about 45 pounds. How many pounds did all the boxes of apples weigh?

45 THINK: 32 × 45 =? Study this model carefully.
×32 Watch the addition of the partial products.
90 (2 × 45 = 90) two-place partial product
1350 (30 × 45 = 1350) four-place partial product
1440 (Sum of the partial products)

2. Study the examples below. Explain each example. Then copy and work them with your book closed.

a.	*b.*	*c.*	*d.*
39	65	28	$.79
×92	×74	×53	×65
78	260	84	395
3510	4550	1400	4740
3588	4810	1484	$51.35

3. How many inches are there in 45 yards of cloth?

Multiply these numbers. Check the products in the first row:

	a	*b*	*c*	*d*	*e*	*f*	*g*
4.	29 ×92	85 ×58	31 ×46	38 ×92	13 ×58	92 ×37	27 ×46
5.	83 ×37	47 ×92	96 ×58	27 ×58	65 ×37	58 ×46	69 ×97
6.	49 ×46	97 ×81	56 ×92	49 ×58	94 ×64	69 ×46	41 ×98
7.	$.69 ×86	$.72 ×46	$.96 ×79	$.14 ×89	$.74 ×37	$.68 ×18	$.47 ×73

SOLVING TWO-STEP PROBLEMS

1. Ann sold 16 bags of candy in the morning and 24 bags in the afternoon. She received 5 cents a bag. How much did she receive in all for the candy she sold?

I. What are you to find?

How much Ann received for the candy she sold.

II. What facts must you know to find the answer?

The number of bags of candy sold.

The price of each bag.

III. What facts are given in the problem?

Ann sold 16 bags in the morning.

Ann sold 24 bags in the afternoon.

Ann received 5 cents a bag.

IV. How can you find the answer?

The number of bags sold in all times the price of one bag equals the amount Ann received.

How many bags were sold? This question is not answered in the problem, and the answer must be found.

First Do This:	Then Do This:
16 bags sold in morning +24 bags sold in afternoon 40 bags sold in all	To find the answer, multiply 5¢ by 40. $40 \times 5¢ = \$2.00$

V. Is the answer reasonable? Check the work.

2. In the bookstore there were 6 boxes of pencils each containing 12 pencils. How much would be received for the pencils if they were sold for 5 cents each?

3. Joan picked 24 red roses and 16 pink roses. She divided the roses into 8 bouquets. How many roses did she put into each bouquet?

4. Can you solve problem 1 in another way?

BUYING BY THE ROADSIDE

These boys are selling some vegetables that they raised in their garden. For how much are they selling berries?

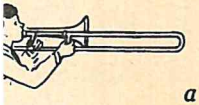
1. They sold to the owner of a fruit store 48 boxes of berries. How much did they receive in all for the berries?

2. In the city the berries were sold for $.22 a box. How much less than the city price did the boys receive a box?

3. They sold melons at 5 for a quarter. How much was that a melon? How much did they receive for 40 melons?

4. They gathered 96 carrots. How many bunches could they make if they put 8 carrots in each bunch?

*5. What are some of the expenses of having a garden?



LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$8\overline{)750}$	47×10	$9821 - 2934$	56×80	$6\overline{)427}$
2.	24×46	$\frac{1}{5}$ of 75 =	$9\overline{)804}$	$\$87.04 - 29.05$	89×79
3.	$8964 - 95$	$7\overline{)\$14.49}$	$\$.35 \times 40$	$4\overline{)740}$	40×70

4. Find the sum of $.52, $16.95, $7.29, and $.08.

MORE PROBLEMS TO SOLVE

These problems are all two-step problems. Some of them can be solved in several ways. First find the hidden question in each problem. Then solve the problem.

1. Jane had 15 cents. She spent 8 cents for some candy. That night her brother gave her a quarter. How much money did she then have?

2. John had 100 marbles. Of them 40 were green and 25 were red. How many of the marbles were neither green nor red?

3. Betty has 10 nickels and 36 cents in her bank. How much does she have in all in her bank?

4. Mrs. Johnson bought 12 dozen flowers. She wishes to divide them into 8 bouquets of the same size. How many flowers should she put into each bouquet?

5. Alice helped her mother bake cookies. She baked in all 144 cookies. She gave 2 dozen to her grandmother who lived next door. How many cookies were left?

6. John had 48 pennies. On his birthday his father gave him 12 pennies. He exchanged the pennies for nickels at the bank. How many nickels did he receive?

7. The girls' club made 15 handkerchiefs and 24 napkins. They sold them all at 5 cents apiece. How much did they receive for them?

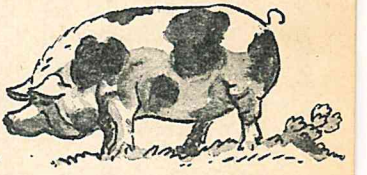
8. Jack had 30 papers to sell. He sold all but 6 of them at 3 cents each. How much did he receive for the papers he sold?

9. At the school fair Ann sold 3 dozen balloons at 5 cents each. How much did she receive in all for the balloons?

10. Fred had 8 pet rabbits. Jack had 2 more than Fred had. How many pet rabbits did the two boys have?

MULTIPLYING LARGER NUMBERS

1. A farmer sold 48 pigs. If they weighed on the average 215 pounds, how much did the pigs weigh in all?



215	THINK: 48 × 215 lb. = ?
×48	First multiply 215 by 8.
1720	Then multiply 215 by 40.
8600	Then add the partial products.
10320	The pigs weighed 10,320 pounds.

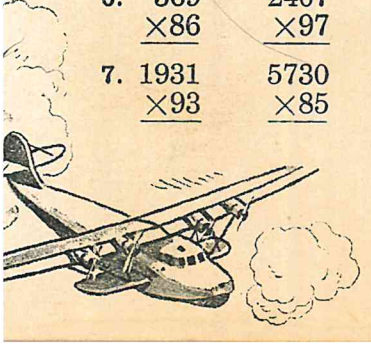
2. Study the examples below. Explain each partial product. Then copy and work the examples with your book closed.

a.	*b.*	*c.*	*d.*
134	347	3109	$29.50
×25	×52	×35	×67
670	694	15545	20650
2680	17350	93270	177000
3350	18044	108815	$1976.50

3. The Clipper which flies from New York to Europe averages about 165 miles an hour. How far does it fly in 16 hours?

Multiply the following. Check the work by going over it again.

	a	*b*	*c*	*d*	*e*	*f*
4.	319	426	318	208	264	$5.94
	×42	×58	×79	×42	×76	×93
5.	589	967	713	978	702	$8.20
	×76	×24	×67	×32	×68	×39
6.	369	2407	2917	3459	9580	$86.40
	×86	×97	×57	×24	×58	×75
7.	1931	5730	4158	3090	2697	$36.59
	×93	×85	×68	×75	×39	×97



MULTIPLYING DOLLARS AND CENTS

1. At $1.25 each how much do 18 baseballs cost?

$1.25
×18
1000
1250
$22.50

THINK: 18 × $1.25 = ?

In multiplying dollars and cents, first multiply as in multiplying whole numbers.

Be sure to put a decimal point to show dollars and cents in the product. Write the $ sign.

The cost of 18 baseballs is $22.50.

2. At 15 cents each how much do 32 children's tickets for a football game cost?

$.15
×32
30
450
$4.80

First change 15 cents to $.15.

Then multiply $.15 by 32.

Be sure to put a decimal point between the dollars and cents in the product. Write the $ sign.

The tickets would cost $4.80.

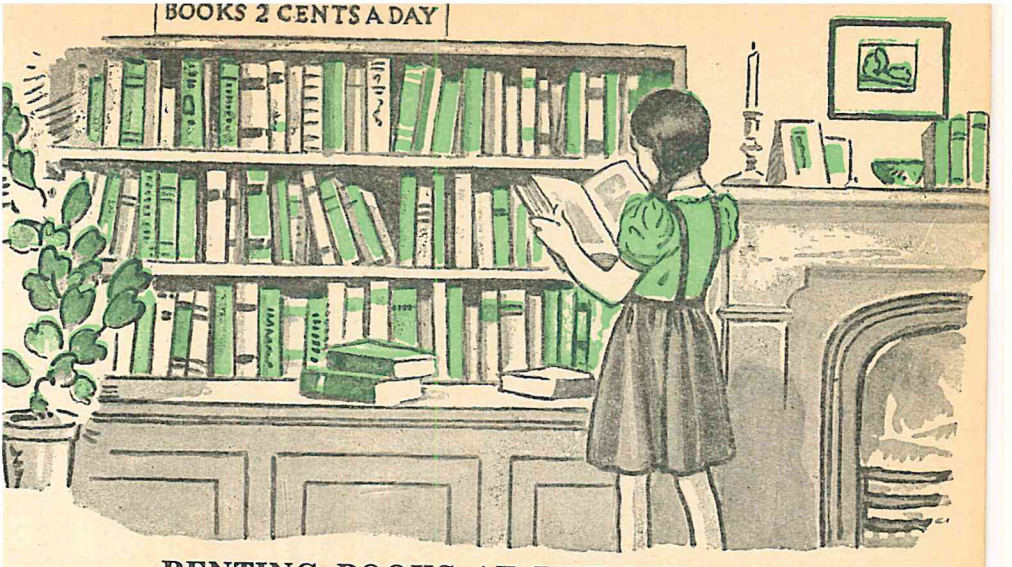
3. At 25 cents each how much do 32 tickets for adults cost?

4. At one game 75 pennants were sold at 10 cents each. How much was received for the pennants?

5. If a football costs $4.75, find the cost of the two dozen footballs the high school football team used one fall.

Multiply the following:

	a	*b*	*c*	*d*	*e*
6.	$.27 ×96	$.65 ×72	$.16 ×58	$.82 ×43	$.49 ×27
7.	$2.80 ×79	$1.95 ×43	$3.07 ×34	$8.31 ×69	$7.09 ×85
8.	$45.96 ×96	$95.30 ×86	$13.78 ×72	$24.85 ×58	$70.46 ×34



RENTING BOOKS AT THE LIBRARY

Julia went to the library to get the new book everyone was reading. She could not find it on the regular shelves. "That book is on the rental shelf," said the librarian.

1. The library charged 2 cents a day for the book. Julia kept the book for 4 days. How much change should she receive if she gave the clerk a quarter?

2. The library paid $1.40 for the book Julia read. How many days must the book be rented before the money received equals the cost of the book? Where does the public library get the money it spends for books?

3. A book that cost $1.20 has been rented for 48 days. How many more days must the book be rented to get enough money to equal the cost of the book?

*4. Mr. Jones has a rental library in his store. He rents books for 3 cents a day. He rented a book for 40 days and then sold it for $.75. The book had cost him $1.65. How much more than he paid for the book was the total he received for the rent and from the sale of the book?

FINDING ERRORS IN MULTIPLICATION

In these examples there are the kinds of errors that are sometimes made in multiplying numbers. Study each example until you find the error. Then copy the examples and work them correctly on your paper.

1. $\begin{array}{r} 746 \\ \times 8 \\ \hline 4978 \end{array}$

2. $\begin{array}{r} 805 \\ \times 6 \\ \hline 510 \end{array}$

3. $\begin{array}{r} 740 \\ \times 6 \\ \hline 4446 \end{array}$

4. $\begin{array}{r} \$7.28 \\ \times 4 \\ \hline 2912 \end{array}$

5. $\begin{array}{r} 204 \\ \times 30 \\ \hline 720 \end{array}$

6. $\begin{array}{r} 47 \\ \times 48 \\ \hline 376 \\ 1880 \\ \hline 2266 \end{array}$

7. $\begin{array}{r} 380 \\ \times 53 \\ \hline 1143 \\ 15450 \\ \hline 16593 \end{array}$

8. $\begin{array}{r} \$3.59 \\ \times 29 \\ \hline 3233 \\ 7180 \\ \hline \$104.23 \end{array}$

A GAME WITH NUMBERS

Copy the numbers and signs below. Then write in the missing numbers.

1. $19 + (?) = 27$
2. $35 - (?) = 22$
3. $7 \times (?) = 56$
4. $27 \div (?) = 9$
5. $35 + (?) = 75$
6. $60 - 25 = (?)$
7. $63 \div (?) = 7$
8. $(?) \times 7 = 35$
9. $15 + 38 = (?)$
10. $9 \times (?) = 54$
11. $(?) \div 5 = 8$
12. $(?) - 12 = 45$
13. $5 \times (?) = 80$
14. $(?) + 48 = 90$
15. $78 \div 3 = (?)$
16. $73 - 25 = (?)$
17. $97 + (?) = 135$
18. $(?) \div 7 = 93$
19. $(?) - 38 = 124$
20. $4 \times (?) = 196$
21. $147 + 829 = (?)$
22. $640 - (?) = 509$
23. $72 \div (?) = 8$
24. $10 \times (?) = 140$

*25. Make up 25 examples like these and have another pupil give the missing numbers.

FINES AT THE LIBRARY

Arthur drew a book from the library. He kept the book for 18 days. The library charges 2 cents a day for each day longer than 2 weeks that the book is kept. This charge is called a "fine." Can you give a good reason why libraries fine people for keeping books longer than a certain number of days?

1. How many days longer than 2 weeks did Arthur keep the book? How long may books be kept from your library before fines must be paid?

2. When he paid the fine, he gave the clerk a quarter. How much change should he receive?

3. Joan kept a book for 23 days. How much is the fine she must pay?

4. David drew a book from the library on October 3 and kept the book until October 20. How large is the fine he must pay?

5. Doris had to pay a fine of 15 cents on each of three library books whose covers were damaged because she did not protect them during a rain. She also had to pay a fine of 18 cents for keeping the books too long. How much did she have to pay in all?

*6. Tell other ways in which children sometimes damage books. Is it right for the library to charge fines on books we damage?

PROBLEMS TO SOLVE

These problems are all two-step problems. First, find the hidden question. Then solve the problem. Some of them can be solved in several ways.

1. How much do 16 quarts of milk cost at 28 cents a gallon?

2. Jack had 45 cents. He spent 25 cents for a movie ticket. How much less than a dollar did he then have?

3. Arthur had 65 cents to spend at the fair. After he had spent 40 cents, how many 5-cent tickets could he buy with the money he had left?

4. A milkman divided 60 quarts of milk into 5 equal parts to feed to his pigs. How many gallons were there in each part?

5. Three boys received 45 cents for raking a lawn. They shared the money equally. One of the boys already had 25 cents. How much money did he have after he received his share?

6. At the store Alice paid 14 cents for 2 pounds of sugar and 10 cents for a loaf of bread. How much less was the cost of a pound of sugar than the cost of a loaf of bread?

7. For her lunch Martha bought 2 sandwiches at 4 cents each and a pint of milk for 5 cents. How much did she spend for her lunch?

8. Carolyn's mother bought a 5-pound roast which cost 28 cents a pound. How much change should she receive from a $5 bill?

9. On the school playground there were 42 boys. How many more than enough for four teams of 9 boys each were there?

10. Last summer Mary spent the months of June and July and also the first 9 days of August at summer camp. How many weeks was she at camp?

DIAGNOSTIC TEST IN MULTIPLICATION

If you have difficulty with any of these examples, turn for help to the page in heavy type at the end of the row.

Part I

	a	*b*	*c*	*d*	*e*	*f*	
1.	18 ×10	12 ×10	70 ×10	65 ×10	80 ×10	20 ×10	(48)
2.	25 ×20	38 ×30	$.45 ×80	67 ×60	80 ×50	$.40 ×40	(49) (55)
3.	23 ×13	43 ×21	12 ×49	27 ×26	$.16 ×54	$.12 ×24	(60)

Part II

1.	59 ×73	68 ×94	47 ×58	86 ×37	$.79 ×64	$.83 ×26	(65)
2.	147 ×37	826 ×64	749 ×62	396 ×85	$17.29 ×49	$28.06 ×97	(69) (70)
3.	$.74 ×28	$.85 ×46	$.78 ×93	$4.96 ×75	$9.35 ×82	$7.09 ×64	(70)

*INTERESTING FACTS TO FIND OUT

If you do not need further practice on multiplication, find out and tell the class about any of the topics given below.

1. How banks help us.
2. How the clock helps us to live together.
3. Measures used in the home.
4. The things we ship to other countries.
5. Where the money for the schools comes from.
6. The cost of a trip on the Atlantic Clipper
7. Traffic fines.
8. The value of the books in our library.

THE NEWS—SEVEN DAYS A WEEK

At the newsstand the newspaper that the Smith family reads costs 3 cents a copy on week days and 10 cents a copy on Sundays. The family can subscribe for the week-day papers for 55 cents a month, for the Sunday paper for 35 cents a month, or for both weekly and Sunday papers for 85 cents a month. The papers would be delivered.

1. Tell how you would find how much less it costs to subscribe by the month than to buy the paper each day in February.

2. How many week days are there in February in ordinary years? Use the calendar to find out. How many Sundays are there?

3. How much would the newspapers for all the week days cost if bought at the newsstand?

FEBRUARY

Sun.	*Mon.*	*Tues.*	*Wed.*	*Thur.*	*Fri.*	*Sat.*
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

4. How much less would they cost if bought by the month and delivered to the home by the newsboy?

5. How much would the Sunday newspapers cost?

6. How much less would they cost if bought by the month?

7. Using the costs for papers in problems 3 and 5, find the total cost of the newspaper for the month of February if bought at a newsstand.

8. How much less than the total cost for the month at newsstands is the cost of the newspapers delivered to the home?

9. In March of that year there were 26 week days and 5 Sundays. How much would be saved by the Smith family by taking the paper by the month instead of buying it each day at the newsstand?

MARCH

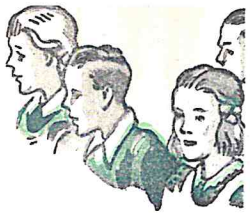
Sun.	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

10. In a year of 365 days there are usually 52 Sundays. How much would both the daily and Sunday newspapers for the year cost the Smith family if they were bought at the newsstand?

11. How much would the newspapers cost them a year, if subscribed for at 85 cents a month?

12. How much would be saved in the year by buying the daily and Sunday papers by the month instead of by the day?

*13. Find the newsstand prices of daily and Sunday newspapers that are sold where you live. Find also the subscription rates for the daily and Sunday papers by the month. Then find how much is saved by getting the papers by the month instead of buying them at the newsstand.



WHICH IS MORE?

Which is more, 30 inches or 2 feet?

THINK: 2 ft. = 2 × 12 in. = 24 in.

Therefore, 30 inches is 6 inches more than 2 feet.

On your paper number 16 lines. On the lines write the part that is more. Then tell how much more.

1. 3 ft. or 40 in.
2. 4 gal. or 10 qt.
3. 15 da. or 2 wk.
4. 2 yr. or 18 mo.
5. 300 min. or 8 hr.
6. 9 ft. or 4 yd.
7. 3 lb. or 40 oz.
8. 8 dimes or $1
9. 2 bu. or 20 pk.
10. 3 tons or 5,000 lb.
11. 1 mi. or 4,000 ft.
12. 30 things or 3 doz.
13. 3 qt. or 8 pt.
14. 80 da. or 2 wk.
15. 800 da. or 2 yr.
16. 5 yd. or 100 in.

INFORMATION PLEASE!

Play this game of **Information Please** with the members of your group. Think of other arithmetic questions to ask your group. Who gave the most correct answers? Who asked the most interesting questions?

1. Why is it a good plan to check sales slips?
2. What ways of measuring things does the driver of an automobile use to check up on his car?
3. Of what things does the United States produce more than the rest of the world?
4. When do we find the "average"? Give an example, showing what the average means.
5. How does the library use arithmetic?
6. In what ways are renting and owning a book different?
7. How does a library decide how large a fine a person must pay?
8. What is the cheapest way to buy newspapers?

LET'S PRACTICE

Each set of examples contains some of the kinds of examples you have learned to work. Work the examples one set a day. Do not be satisfied until you can work every example easily and correctly. If you need more practice, repeat the same set several times.

Set I

1. 55 / 71 / 96 / 77 / 85 / 98

2. 57×10

3. $701 - 602$

4. $2\overline{)96}$

5. $9140 - 8460$

6. $4\overline{)93}$

7. $8000 - 2560$

8. $\$4.23 \times 13$

9. $5\overline{)3295}$

10. 590×79

Set II

1. 936 / 45 / 9 / 48 / 2 / 954

2. 60×10

3. $854 - 54$

4. $8\overline{)427}$

5. $3\overline{)916}$

6. 68×94

7. $7528 - 1839$

8. $\$8.35 \times 64$

9. $\$124.20 - 66.25$

10. $3\overline{)299}$

USING THE VOCABULARY OF ARITHMETIC

Be ready to explain the meaning of each word.

account	weight	fraction	compare
distance	magic square	reduction	practice
sales slip	hundreds' place	cheap	two-place number
gallon	measurements	average	estimate

HOW WELL DO YOU REMEMBER?

1. What is a quick way to multiply 7 by 10? How much is 10×7?

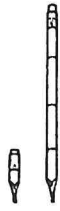
2. How many are 5 tens? 15 tens? 30 tens?

3. Explain how to work this example: 20×38.

4. Draw a square. Shade $\frac{1}{4}$ of it. How do you know that you have shaded $\frac{1}{4}$ of the square?

5. How do we find $\frac{1}{3}$ of 18?

6. Compare the lengths of two pencils at the right. Tell what part the short one is of the long one. Tell how many times as long as the short pencil the long pencil is.



7. What is wrong with this product? $40 \times \$.25 = 1000$.

8. If a boy reads 75 pages in 5 hours, how do you find the average number of pages he reads an hour?

9. What is a two-step problem?

10. What is meant by "renting a book"? a "fine"?

11. Write thirty cents in figures in three ways, one of them using the dollar sign.

12. What is a "diagnostic test"? How does such a test help you?

13. What does it mean to "estimate" the answer to a problem?

14. How do we check the work in this example, 15×89?

15. Which is most, $\frac{1}{2}$, $\frac{1}{4}$, or $\frac{1}{8}$?

16. Name the largest unit of measure that you know for measuring the following:

weight time distance liquid measure

17. How do we change feet to inches? feet to yards?

18. Divide and check: $783 \div 6 = ?$

19. Multiply and check: $25 \times \$2.75$.

MEASURING GROWTH IN PROBLEM SOLVING

1. John bought a ball for $1.25. How much change should he receive from a $5 bill?

2. How much does $\frac{1}{4}$ pound of tea cost if one pound of tea costs $.92?

3. Ann bought a hat for $2.70, a dress costing $9.85, and a coat costing $11.38. How much did she spend in all?

4. On an automobile trip Paul's father drove 405 miles in 9 hours. How many miles did he drive on the average an hour?

5. A speedy airplane flew 248 miles in an hour. How far can it fly at that rate in 4 hours?

6. A grocer bought 10 boxes of canned cherries. In each box there were 24 cans. How many cans were there in the 10 boxes?

7. At a sale Tom bought a baseball suit for $3.25. This was $1.20 less than the regular price. What was the regular price?

8. A church prepared 35 Thanksgiving baskets. The things in each basket were worth $4.85. What was the value of all of the Thanksgiving baskets?

9. Mary picked 64 big red roses to sell at the flower sale. She divided them into bouquets of 8 roses each. She sold them all at 25 cents for each bouquet. How much did she receive in all for the flowers?

10. Patty is reading a story book. On one day she read 28 pages, the next day 35 pages, and the next day 30 pages. How many pages did she read on the average a day?

What Your Score Means

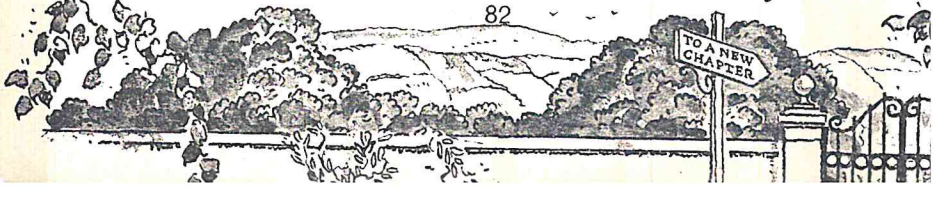
Unsatisfactory	Fair	Good	Excellent
0 1 2 3 4	5 6	7 8	9 10

OPENING THE GATE TO THE NEW CHAPTER

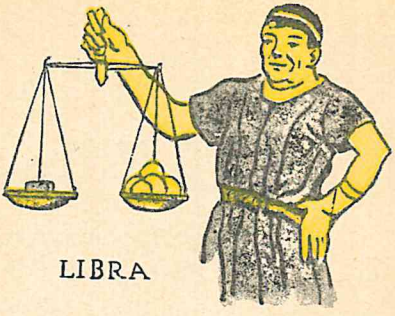
This test will help you to find out how well you can work the different kinds of examples you have studied.

1. Find the sum of \$2.75, \$6.48, \$.27, and \$.09. (14)
2. Subtract 7864 from 9000. (17)
3. Subtract \$8.75 from \$385.40. (19)
4. Multiply 807 by 9. (25)
5. Multiply \$3.75 by 6. (27)
6. How much is $\frac{1}{8}$ of \$4.80? (29)
7. Divide 825 by 5 and check your answer. (30)
8. Divide 723 by 4 and check your answer. (33)
9. How much is 10×36? (48)
10. Multiply: $20 \times 38 = ?$ (49)
11. How much do 30 notebooks cost at \$.15 each? (55)
12. Multiply: $24 \times 38 = ?$ (60)
13. Multiply: $48 \times 67 = ?$ (65)
14. Find the product of 89×807. (69)
15. How much is $83 \times \$2.46$? (70)
16. How many minutes are there in 24 hours? (32)
17. How many yards are there in 5,280 feet? (34)
18. Write in words: 7,100,208. (24)
19. Write in figures: nine billion dollars. (24)
20. Draw a circle. Shade $\frac{1}{4}$ of it. (51)

After your paper has been marked, study and do again any examples you worked incorrectly. Turn for help to the pages given at the right. Do not be satisfied until you can do all of the work in this test easily and correctly.



YARD



LIBRA

OLD AND NEW WAYS OF MEASURING

King Henry I of England established the yard as the distance from his nose to the end of his arm. The Romans first used the libra, or pound, which was the weight of 7,680 grains of wheat.

1. Why was the use of grains of wheat a poor way to measure the weight of things?

2. In some states it is against the law to sell things by the bushel. People must sell by the pound instead. Why is it better to buy things by the pound instead of by the bushel?

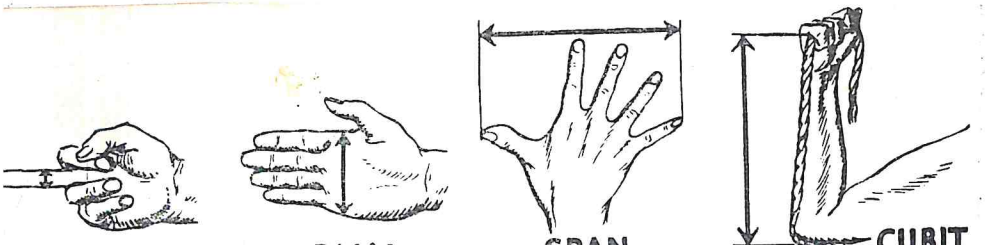
3. Which is the fairer way to sell bananas, by the dozen or by the pound? How about eggs and oranges?

4. Does it cost as much to mail a letter that weighs $\frac{1}{2}$ ounce as it does to mail one that weighs 1 ounce?

5. The Indians knew nothing about seconds, minutes, or hours until the white man came. Why didn't Indians need these measures? Why do we need them today? How did the Indians tell time?

6. Some peoples many years ago measured time with the sun dial. How does a sun dial work? Could they tell time at night with a sun dial? What other disadvantages did a sun dial have?

7. The Romans measured the mile as 1000 paces, each pace 5 feet long. Would this way be very accurate?



HOW WAYS OF MEASURING HAVE CHANGED

Long before men invented the foot ruler or the yardstick, they used other methods of measurement. The most widely used method was to take the length of some part of the body as a unit of measure.

1. With a ruler measure as accurately as you can the length of your "digits"; your "palm"; your "span"; and your "cubit." Compare your measurements with those of other children in the class. Are they the same?

2. Let a large boy and then a small girl measure the height of some pupil to find how many "spans" tall the pupil is. Are the two measurements the same? What does this show?

3. It is said that the length of a man's foot was once used to measure distances. Measure the length of the shoes worn by the largest and the smallest pupils in your room. Are they the same?

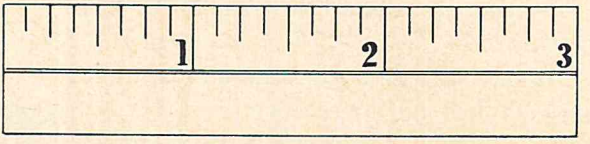
4. Sometimes the length of a step or pace was used to measure distance. Why is this not a good method of measurement?

5. Why is the foot ruler a better way to measure than a man's foot or his step?

6. To make certain that all people will know exactly how long a foot measure is, our government has placed in the Bureau of Standards in Washington a ruler that by law is one foot long. Why is it necessary to have a **standard foot**?

A RULER HAS FRACTIONS

How long is the picture of the calendar on page 77? How wide? To measure short distances accurately, we must use a ruler divided into fractions of an inch, such as are shown on the piece of ruler below.



1. How many inches long is this piece of ruler? How many inches are there in a foot?

2. Into what parts is each inch of this ruler divided?

3. Point to the half-inch marks; the quarter-inch marks; the eighth-inch marks. Are the inches on your ruler divided in the same way?

4. Which is more, $\frac{1}{2}$ inch or $\frac{1}{4}$ inch? $\frac{1}{8}$ inch or $\frac{1}{4}$ inch?

5. How many $\frac{1}{4}$ inches are there in 1 inch? in $\frac{1}{2}$ inch? in $\frac{3}{4}$ inch?

6. How many $\frac{1}{8}$ inches are there in 1 inch? in $\frac{1}{2}$ inch? in $\frac{1}{4}$ inch? in $\frac{5}{8}$ inch?

7. Use a ruler to measure the lengths of the lines below.

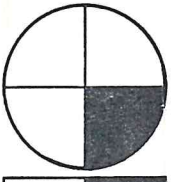
A_____ B_____ C_____

8. Use your ruler to draw lines of the following lengths: $2\frac{1}{2}$ in.; $1\frac{1}{4}$ in.; $1\frac{3}{4}$ in.; $2\frac{1}{8}$ in.; $1\frac{3}{8}$ in.

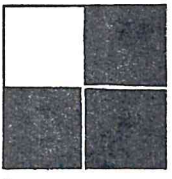
9. If we did not have fractions how could we express exactly lengths of less than an inch? between 1 inch and 2 inches?

10. In the number $3\frac{1}{2}$, does the $\frac{1}{2}$ have any place value? Why may we say that common fractions are an addition to our number system?

HOW TO READ AND WRITE FRACTIONS



1. What part of the circle at the right is colored? One fourth is written with numbers like this: $\frac{1}{4}$. The $_4$ below the line shows into how many equal parts the circle is divided. The ^{1} above the line shows how many of the parts are colored.



2. What part of the square at the right is not colored? What part is colored?

3. Draw a circle. Divide it into eighths. Color three eighths ($\frac{3}{8}$) of the circle.

Numbers like $\frac{1}{2}$, $\frac{3}{4}$, $\frac{3}{8}$, and $\frac{2}{2}$ are called **fractions.**

4. Read these fractions: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{4}{8}$, $\frac{2}{3}$, $\frac{7}{8}$, $\frac{4}{4}$.

5. Write these fractions with figures: five eighths; one fifth; three tenths; five sixths; two halves.

The parts of a fraction are called its **terms.** In the fraction $\frac{7}{8}$, the 7 is called the **numerator** and the 8 the **denominator.**

$\longrightarrow 7$ numerator

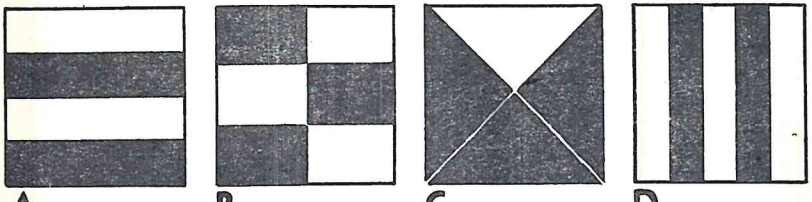
$\longrightarrow \overline{8}$ denominator

6. Name the numerators of the following fractions:

$\frac{3}{5}$ $\frac{1}{2}$ $\frac{5}{8}$ $\frac{4}{4}$ $\frac{7}{3}$ $\frac{9}{10}$

7. Name the denominators of the above fractions.

8. What fraction of each square below is colored?



9. What fraction of each square is not colored?

10. Draw a square and shade $\frac{5}{6}$ of it.

USING A RULER

Do you really know how long an inch is?

1. How long do you think line *a* below is?

*a*_____

*b*_____

*c*_____

2. Number three spaces on your paper *a*, *b*, and *c*. In these spaces write your estimates of the lengths of lines *a*, *b*, and *c*.

3. Now take your ruler and measure the length of line *a*. Write your measurement after your estimate. Was your estimate correct, too large, or too small?

4. Now measure lines *b* and *c* and write your measurements after your estimates. Were your estimates correct? If not, were they too large, or too small?

5. With your ruler draw lines that have the following lengths. Write its length above each line:

a. $1\frac{1}{4}$ in. *b*. $1\frac{7}{8}$ in. *c*. $2\frac{1}{2}$ in. *d*. $3\frac{3}{4}$ in.

6. Try to draw a line exactly $5\frac{1}{8}$ inches long on the blackboard with chalk and a ruler. Is this easy to do?

LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	\$78.50 +27.48	9000 −1704	368 ×8	$\frac{1}{6}$ of 96 =	$8\overline{)1600}$
2.	25 ×10	\$275.08 −9.67	8010 −2046	\$7.40 ×5	86 ×32
3.	$5\overline{)540}$	\$1.32 ×49	35 ×30	$4\overline{)321}$	$\frac{1}{3}$ of 81 =

4. \$7.68 + \$18.95 + \$4.62 + \$.17 =

READINESS TEST FOR ADDING FRACTIONS

Are you ready for the new work in adding fractions?

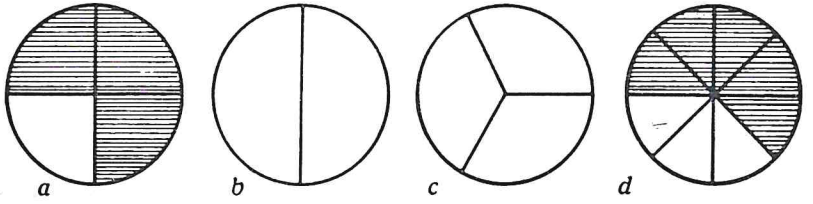
I. Reading fractions. Write these fractions as words:

$\frac{2}{3}$ $\frac{1}{2}$ $\frac{3}{4}$ $\frac{7}{8}$

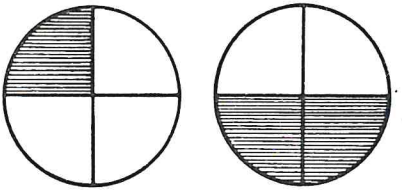
II. Writing fractions. Express these words in figures:

1. One sixth
2. Two fourths
3. Five sixths
4. Three eighths

III. Telling the meaning of fractions.

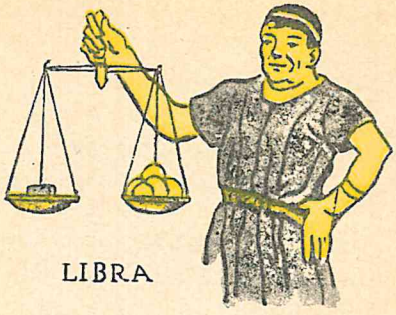


1. Which of the circles is divided into halves?
2. Which of the circles is divided into fourths?
3. What part of the circle is each small part in circle *c*?
4. What part of the circle is each small part in circle *d*?
5. What part of circle *a* is shaded?
6. What part of circle *d* is not shaded?
7. Draw a square. Divide it into four equal parts. What part of the square is each part?
8. In all, how many fourths of the two circles at the right are shaded? $\frac{1}{4}$ plus $\frac{2}{4}$ equals how many fourths?



9. How many fourths of the two circles are not shaded?
10. Draw two circles. Use them to show that $\frac{1}{4} + \frac{1}{4}$ equals $\frac{2}{4}$.

YARD



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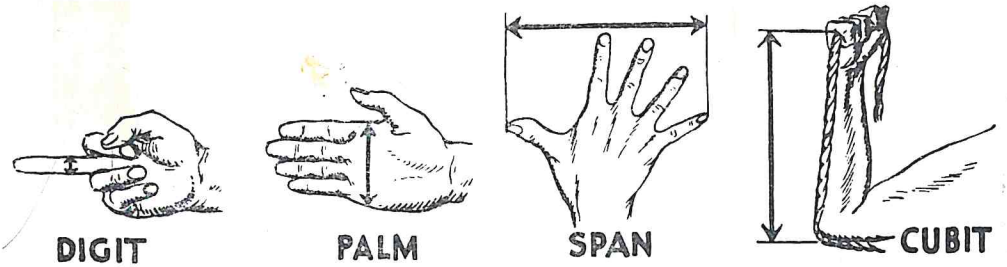

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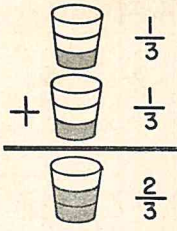
ADDING LIKE FRACTIONS



1. Jane drank $\frac{1}{3}$ glass of orange juice for breakfast and $\frac{1}{3}$ glass for supper. How much orange juice did she drink?

THINK: $\frac{1}{3}$ glass + $\frac{1}{3}$ glass = ?

One third and one third are two thirds, just as one cent and one cent are two cents.

Jane drank $\frac{2}{3}$ glass of orange juice.

Fractions with the same denominator, as $\frac{1}{3}$ and $\frac{2}{3}$ or $\frac{1}{4}$ and $\frac{3}{4}$, are called like fractions.

2. Name three other pairs of like fractions.

3. One fourth and two fourths are how many fourths?

4. Study the examples below and show that the sums are correct.

a.	*b.*	*c.*	*d.*	*e.*
$\frac{1}{4}$	$\frac{2}{5}$	$\frac{5}{8}$	$\frac{4}{6}$	$\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$
$\frac{2}{4}$	$\frac{2}{5}$	$\frac{2}{8}$	$\frac{1}{6}$	
$\frac{3}{4}$	$\frac{4}{5}$	$\frac{7}{8}$	$\frac{5}{6}$	*f.* $\frac{2}{4} + \frac{1}{4} = \frac{3}{4}$

5. Copy, and work the examples with your book closed.

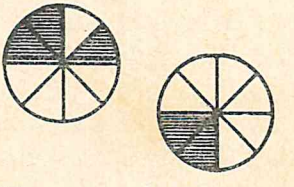
To add two or more like fractions, add their numerators and write the sum over their denominator.

Find the sums:

	a	*b*	*c*	*d*	*e*
6.	$\frac{1}{5}$	$\frac{2}{4}$	$\frac{3}{5}$	$\frac{2}{6}$	$\frac{3}{8}$
	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{3}{6}$	$\frac{4}{8}$

	a	*b*	*c*	*d*	*e*
7.	$\frac{1}{4}$	$\frac{2}{5}$	$\frac{1}{8}$	$\frac{3}{10}$	$\frac{2}{6}$
	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{3}{8}$	$\frac{2}{10}$	$\frac{1}{6}$
	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{8}$	$\frac{4}{10}$	$\frac{2}{6}$

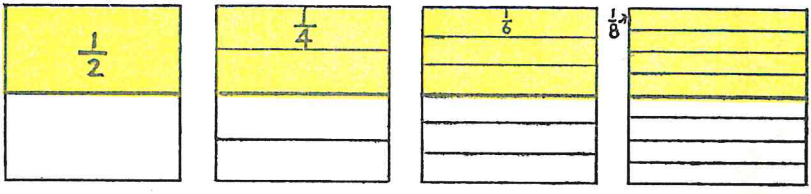
8. How many eighths of the two circles at the right are shaded?



9. Mary's mother used $\frac{1}{8}$ pound of butter for a cake and $\frac{2}{8}$ pound for some candy. How much butter did she use in all?

DIFFERENT FRACTIONS WITH THE SAME VALUE

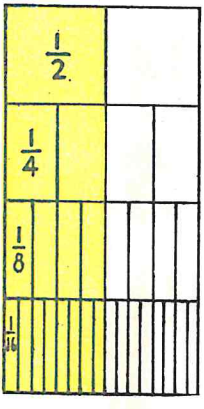
These drawings will show you how fractional parts of several like squares compare.



Look at the drawings. How many halves are in 1 whole? How many fourths are in 1 whole? How many sixths?

Compare the halves, fourths, sixths, and eighths in the drawings, and be ready to answer the questions below.

1. How many fourths equal $\frac{1}{2}$?
2. How many sixths equal $\frac{1}{2}$?
3. How many eighths equal $\frac{1}{2}$?
4. How many eighths equal $\frac{1}{4}$? $\frac{2}{4}$? $\frac{3}{4}$? $\frac{3}{6}$?
5. How many fourths equal $\frac{2}{2}$? $\frac{6}{6}$? $\frac{8}{8}$?
6. How many eighths equal 1 whole?



Use the drawing at the right to answer the questions below.

7. How many sixteenths are there in $\frac{1}{2}$? in $\frac{1}{4}$? in $\frac{3}{4}$?
8. How many sixteenths are there in $\frac{1}{8}$? $\frac{2}{8}$? $\frac{3}{8}$? $\frac{4}{8}$? $\frac{5}{8}$? $\frac{6}{8}$? $\frac{7}{8}$?

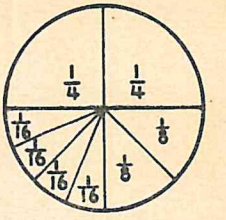
Use any of the drawings to answer the questions below.

9. Which is more, $\frac{1}{2}$ or $\frac{1}{6}$? $\frac{1}{2}$ or $\frac{1}{4}$? $\frac{1}{8}$ or $\frac{1}{6}$?
10. Which is less, $\frac{1}{2}$ or $\frac{3}{4}$? $\frac{1}{2}$ or $\frac{3}{8}$? $\frac{3}{4}$ or $\frac{3}{8}$?

*11. Divide a square into twelfths, and then find how many twelfths there are in $\frac{1}{2}$; $\frac{1}{4}$; $\frac{1}{6}$; $\frac{3}{4}$; $\frac{5}{6}$.

*12. Divide a rectangle into tenths. Then find how many tenths equal $\frac{1}{5}$; $\frac{2}{5}$; $\frac{1}{2}$; $\frac{3}{5}$; $\frac{4}{5}$.

CHANGING FRACTIONS TO LOWER TERMS



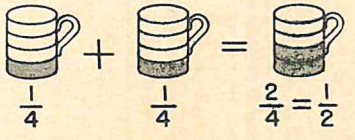
1. We may compare fractional parts within 1 whole. How many fourths are there in $\frac{1}{2}$? You can see that $\frac{1}{2} = \frac{2}{4}$.

2. How many eighths are there in $\frac{1}{4}$? $\frac{1}{4} = \frac{?}{8}$.

3. How many sixteenths are there in $\frac{1}{4}$? $\frac{1}{4} = \frac{?}{16}$.

You can see that the fractions $\frac{1}{4}$, $\frac{2}{8}$, and $\frac{4}{16}$ all have the same value, but that the numbers in them are different.

4. A recipe called for $\frac{1}{4}$ cup of milk and $\frac{1}{4}$ cup of molasses. What part of a cupful did this make together?



THINK: $\frac{1}{4}$ cup + $\frac{1}{4}$ cup = ?
The sum of $\frac{1}{4}$ and $\frac{1}{4}$ is $\frac{2}{4}$.
You know that $\frac{2}{4} = \frac{1}{2}$. Since $\frac{1}{2}$ is a simpler fraction, change $\frac{2}{4}$ to $\frac{1}{2}$.
This made $\frac{1}{2}$ cupful of milk and molasses.

Always express fractions in answers in simplest form.

You know that $\frac{2}{4} = \frac{1}{2}$, and that $\frac{2}{8} = \frac{1}{4}$. An easy way to change $\frac{2}{4}$ to $\frac{1}{2}$ is to divide both terms by 2, as shown at the right.

$$\frac{2 \div 2}{4 \div 2} = \frac{1}{2}$$

5. Study the work at the right to see how to change $\frac{2}{8}$ to $\frac{1}{4}$.

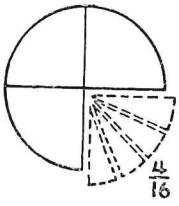
$$\frac{2 \div 2}{8 \div 2} = \frac{1}{4}$$

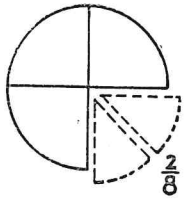
6. Divide both terms of $\frac{4}{16}$ by 4. What fraction do you get?

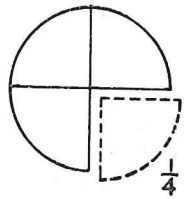
Dividing both terms of a fraction by the same number gives another fraction having the same value.

Changing a fraction to simpler form, as $\frac{4}{16}$ to $\frac{1}{4}$, is called **reducing the fraction to lower terms.** It means that both terms are divided by the same number.

7. Show that $\frac{4}{8}$ equals $\frac{1}{2}$.







REDUCING FRACTIONS TO LOWEST TERMS

This drawing shows that the three fractions, $\frac{4}{16}$, $\frac{2}{8}$, and $\frac{1}{4}$, have the same value. $\frac{4}{16} = \frac{2}{8} = \frac{1}{4}$

1. By what number must the numerator and the denominator of the fraction $\frac{4}{16}$ be divided to get the fraction $\frac{2}{8}$?

2. How do you change $\frac{2}{8}$ to $\frac{1}{4}$?

3. How do you change $\frac{4}{8}$ to $\frac{2}{4}$?

4. Can you divide both terms of $\frac{2}{4}$ by any number? Express $\frac{2}{4}$ in a simpler form.

5. You know that $\frac{2}{4} = \frac{1}{2}$. Can you divide the terms of $\frac{1}{2}$ by any number except 1?

When the terms of a fraction cannot be divided by any number except 1, we say that the fraction is reduced to lowest terms.

6. Is $\frac{6}{8}$ reduced to lowest terms? How can you tell?

7. Is $\frac{5}{6}$ reduced to lowest terms? How can you tell?

8. Reduce the fraction $\frac{8}{16}$ to lowest terms.

$$\frac{8 \div 4}{16 \div 4} = \frac{2}{4}$$

$$\frac{2 \div 2}{4 \div 2} = \frac{1}{2}$$

THINK: both 8 and 16 can be divided by 4.

$\frac{2}{4}$ is not reduced to lowest terms, because both 2 and 4 can be divided by 2.

The fraction $\frac{1}{2}$ is reduced to lowest terms. How can you tell?

Therefore, $\frac{8}{16}$ reduced to lowest terms is $\frac{1}{2}$. In $\frac{1}{2}$ the terms are the smallest numbers possible.

PRACTICE IN REDUCING FRACTIONS

Reduce the following fractions to lowest terms:

1. $\frac{2}{8}$, $\frac{2}{6}$, $\frac{2}{10}$, $\frac{2}{16}$
2. $\frac{5}{10}$, $\frac{2}{12}$, $\frac{9}{12}$, $\frac{10}{20}$
3. $\frac{3}{6}$, $\frac{4}{16}$, $\frac{3}{12}$, $\frac{15}{20}$
4. $\frac{2}{4}$, $\frac{8}{16}$, $\frac{4}{12}$, $\frac{10}{12}$
5. $\frac{4}{6}$, $\frac{4}{10}$, $\frac{6}{12}$, $\frac{5}{20}$
6. $\frac{4}{8}$, $\frac{10}{16}$, $\frac{8}{12}$, $\frac{12}{20}$
7. $\frac{6}{10}$, $\frac{6}{16}$, $\frac{14}{16}$, $\frac{9}{18}$
8. $\frac{6}{8}$, $\frac{8}{10}$, $\frac{12}{16}$, $\frac{12}{24}$

GRADED PRACTICE IN MULTIPLICATION

Work the examples in each row. If you make any errors, turn back to the pages given at the right.

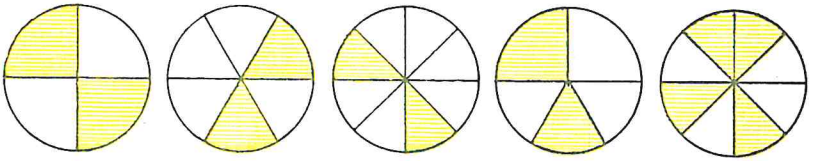
	a	*b*	*c*			*a*	*b*	*c*	
1.	298 × 4	824 × 5	$9.75 × 2	(27)	4.	91 × 40	481 × 80	$3.80 × 20	(49)
2.	560 × 9	$8.06 × 3	900 × 7	(25)	5.	46 × 42	97 × 83	$.75 × 51	(60)
3.	75 × 10	40 × 10	$2.70 × 10	(48)	6.	375 × 48	463 × 97	$5.26 × 69	(69)

GRADED PRACTICE IN DIVISION

Practice these examples in the same way.

	a	*b*	*c*	*d*	*e*	*f*	
1.	2)864	3)639	5)1550	8)6488	6)6666	7)4977	(30)
2.	4)804	6)1860	3)900	7)6370	2)1200	9)8109	(30)
3.	5)75	7)98	2)96	3)84	4)72	6)90	(30)
4.	6)144	9)486	8)776	3)291	7)525	5)395	(30)
5.	7)94	6)99	4)77	3)80	5)83	8)99	(33)
6.	4)271	9)692	7)481	5)422	8)527	6)527	(33)
7.	8)327	4)203	9)725	7)145	6)543	5)404	(33)
8.	9)1827	2)1419	8)3227	7)6510	3)1512	4)1614	(33)

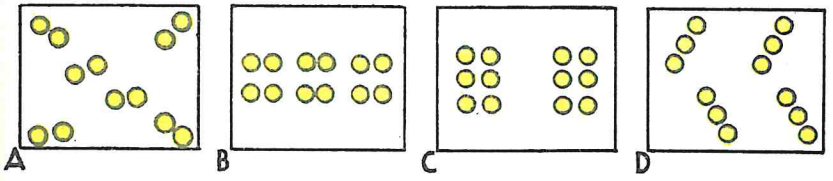
WE CAN MAKE PICTURES OF FRACTIONAL PARTS



a *b* *c* *d* *e*

1. In which of the pictures above is $\frac{1}{2}$ of the picture colored? In which is $\frac{1}{4}$ of the picture colored? In which is $\frac{1}{3}$ colored?

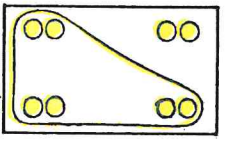
2. In the boxes below, 12 balls are divided into different kinds of groups. In which box are they divided into halves? into thirds? into fourths? into sixths?



3. Draw 8 circles in a box so as to show the 8 circles divided into halves.

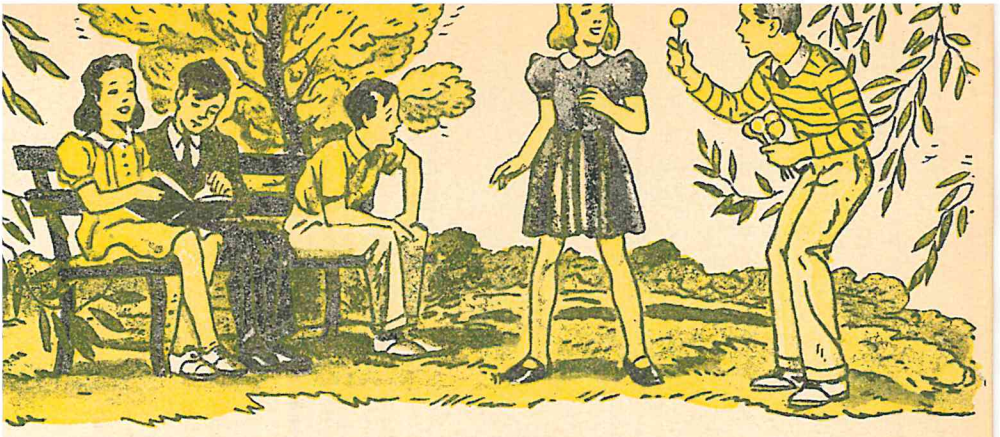
4. In the same way draw a box showing 8 circles divided into fourths.

5. In the box at the right a line is drawn around $\frac{3}{4}$ of the 8 circles. How many circles are there in $\frac{3}{4}$ of the circles? Draw a box like this one and draw a line around $\frac{2}{4}$ of the circles. How many circles are there in $\frac{2}{4}$ of the circles?



6. Use boxes like those in problem 2 to show the following fractions:

a. $\frac{1}{3}$ *b.* $\frac{1}{4}$ *c.* $\frac{2}{3}$ *d.* $\frac{3}{4}$ *e.* $\frac{2}{6}$ *f.* $\frac{5}{6}$ *g.* $\frac{2}{4}$



FRACTIONAL PARTS OF GROUPS

1. In the picture there are two girls and three boys. What part of all of the children in the picture is girls?

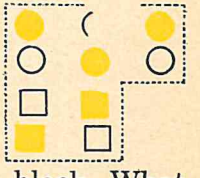
THINK: There are 5 children in all. Each child is therefore $\frac{1}{5}$ of the group. There are two girls in the picture. So $\frac{2}{5}$ of the children in the picture is girls.

2. What fractional part of the group is boys?

3. What part of the group is sitting?

4. What part of the group is standing?

5. What part of the balls at the right is colored? What part is not colored?



6. What part of the squares at the right is colored? What part is not colored?

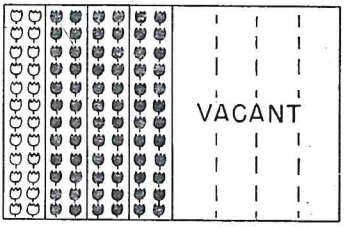
7. Draw 6 small circles. Color $\frac{1}{3}$ of them black. What part of the circles is not colored?

8. Draw 8 small squares. Color $\frac{3}{4}$ of them black. What part of the squares is not colored?

9. Draw 6 small squares. Shade 3 of them. What part of all the circles is shaded? What part is not shaded?

WRITING THE ANSWER IN SIMPLEST FORM

1. Alice planted $\frac{1}{8}$ of this flower bed with plain tulips and $\frac{3}{8}$ with striped tulips. What part of the garden is planted with tulips?



$\frac{1}{8}$
$\frac{3}{8}$
$\frac{4}{8} = \frac{1}{2}$

THINK: $\frac{1}{8} + \frac{3}{8} = ?$
The sum of $\frac{1}{8}$ and $\frac{3}{8}$ is $\frac{4}{8}$. $\frac{4}{8}$ should be reduced to lowest terms. $\frac{4 \div 4}{8 \div 4} = \frac{1}{2}$
Half of the garden is planted with tulips.

2. Study the examples and show that the work is correct.

a. $\frac{1}{4}$, $\frac{1}{4}$, $\frac{2}{4} = \frac{2 \div 2}{4 \div 2} = \frac{1}{2}$

b. $\frac{1}{8}$, $\frac{5}{8}$, $\frac{6}{8} = \frac{6 \div 2}{8 \div 2} = \frac{3}{4}$

c. $\frac{3}{6}$, $\frac{2}{6}$, $\frac{5}{6}$

d. $\frac{3}{6}$, $\frac{1}{6}$, $\frac{4}{6} = \frac{4 \div 2}{6 \div 2} = \frac{2}{3}$

3. Copy and then work these examples with your book closed. **Be sure to reduce fractions to lowest terms.**

4. Which of the fractions given below are reduced to lowest terms? Which are not? How can you tell that they are not reduced to lowest terms?

a. $\frac{2}{3}, \frac{4}{8}, \frac{3}{6}$ *b.* $\frac{6}{8}, \frac{7}{8}, \frac{4}{12}$ *c.* $\frac{5}{10}, \frac{12}{16}, \frac{5}{9}$

5. Reduce the fractions in exercise 4 that are not reduced to lowest terms.

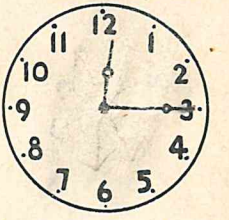
6. Write three fractions that are reduced to lowest terms.

Find the sums. Reduce the fractions to lowest terms:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*
7.	$\frac{1}{8}$ $\frac{1}{8}$	$\frac{1}{6}$ $\frac{1}{6}$	$\frac{3}{8}$ $\frac{3}{8}$	$\frac{1}{4}$ $\frac{1}{4}$	$\frac{2}{6}$ $\frac{1}{6}$	$\frac{3}{8}$ $\frac{1}{8}$	$\frac{1}{6}$ $\frac{3}{6}$	$\frac{1}{8}$ $\frac{3}{8}$	$\frac{5}{8}$ $\frac{1}{8}$
8.	$\frac{1}{3}$ $\frac{1}{3}$	$\frac{1}{8}$ $\frac{5}{8}$	$\frac{1}{10}$ $\frac{1}{10}$	$\frac{1}{6}$ $\frac{2}{6}$	$\frac{2}{8}$ $\frac{5}{8}$	$\frac{2}{4}$ $\frac{1}{4}$	$\frac{3}{10}$ $\frac{2}{10}$	$\frac{1}{6}$ $\frac{4}{6}$	$\frac{3}{6}$ $\frac{1}{6}$

9. Alice has $\frac{3}{8}$ yard of blue cloth and $\frac{3}{8}$ yard of red cloth. How much cloth has she in all?

USING REDUCTION OF FRACTIONS IN FINDING FRACTIONAL PARTS OF MEASURES



If you were asked what part of an hour 15 minutes is, you would say $\frac{1}{4}$ hour. Can you prove that this answer is right?

1. John proved that 15 minutes is $\frac{1}{4}$ hour in this way. He said, "There are 60 minutes in one hour. $\frac{1}{4}$ of 60 minutes is 15 minutes." Show that $\frac{1}{4}$ of 60 is 15. The clock shows that 15 minutes is $\frac{1}{4}$ hour.

2. Alice proved that 15 minutes is $\frac{1}{4}$ hour in another way. She said, "There are 60 minutes in one hour. One minute, therefore, is $\frac{1}{60}$ of an hour and 15 minutes is $\frac{15}{60}$ of an hour. Reduced to lowest terms, $\frac{15}{60}$ is equal to $\frac{1}{4}$." Show by reduction that $\frac{15}{60} = \frac{1}{4}$.

3. Use both ways to show that 30 minutes is $\frac{1}{2}$ hour.

4. Use Alice's method to find what fractional part of an hour each of the following is:

6 min. 10 min. 20 min. 25 min. 36 min. 42 min.

5. What part of a pound is 8 ounces?

THINK: There are 16 ounces in a pound.

1 oz. $= \frac{1}{16}$ lb.; 8 oz. $= \frac{8}{16}$ lb. $= \frac{1}{2}$ lb.

6. Find what part of a pound each of the following is:

2 oz. 4 oz. 6 oz. 10 oz. 12 oz. 14 oz.

7. What part of a foot is each of the following?

2 in. 3 in. 4 in. 6 in. 8 in. 9 in. 10 in.

8. What part of a year is 4 months? 6 months?

9 What part of a yard is 2 feet?

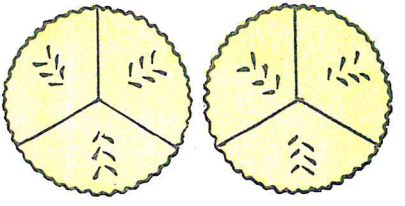
10. On a test of 20 examples Anna had 4 examples incorrect. What part of the examples were incorrect?

THINK: 1 example $= \frac{1}{20}$ of all; 4 examples $= \frac{4}{20}$ of all $=$ (?) of all.

*11. What part of the examples did Anna have correct?

THREE PEOPLE—TWO PIES

1. Mrs. Jones baked 2 small pies. She wanted to share them with Arthur and Ann. She wished to divide the 2 pies equally among three people. Can you tell how Mrs. Jones could divide the pies?



This is what she did. She cut each pie into 3 equal parts. So each person had $\frac{1}{3}$ of each pie. How many thirds of a pie did each one get?

You can see that each person received $\frac{2}{3}$ pie.

2 pies $\div$ 3 $=$ $\frac{2}{3}$ pie. The line between the 2 and 3 in $\frac{2}{3}$ means that 2 is divided by 3.

2. Here are 3 apples.

Here are the 3 apples divided into fourths.

Here are the 12 fourths divided among 4 people.

ARTHUR ANN MARY MOTHER

THINK: 3 $\div$ 4 $=$?

3. Show by a picture how you could divide 4 cookies equally among 5 people. What part of a cookie would each one receive?

Divide, and reduce the fractions to lowest terms:

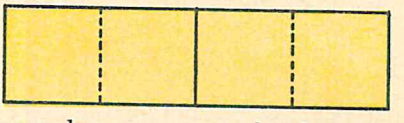
	a	*b*	*c*	*d*
4.	2 $\div$ 5 $=$	4 $\div$ 5 $=$	10 $\div$ 12 $=$	10 $\div$ 20 $=$
5.	12 $\div$ 24 $=$	4 $\div$ 16 $=$	16 $\div$ 28 $=$	15 $\div$ 24 $=$

6. You can see that $8\overline{)4}$, 4 $\div$ 8, and $\frac{4}{8}$ are three ways of saying four divided by eight. Write in three ways: six divided by nine; $6\overline{)12}$; $\frac{11}{20}$; 2 $\div$ 5.

MISS SMITH HELPS THE CLASS

Some of the children in Miss Smith's class did not understand how to divide more than one of anything into equal parts. When she explained it to them as shown below, they understood it.

1. Miss Smith took a piece of paper like the one below. It is 2 inches long. She folded it so that it was divided into 4 equal parts. Show how to fold the paper.



2. With your ruler measure the length of each of the four parts of the paper. When Miss Smith divided the 2 inches into 4 parts, how long was each part? 2 in. $\div$ 4 = ?

3. Another way to show 2 $\div$ 4 is to write the 2 over the 4 like this, $\frac{2}{4}$. The line between the 2 and 4 is the sign of division. Does $\frac{2}{4}$ equal $\frac{1}{2}$? Is this the same as the length of each part of the paper?

4. Take a piece of paper 3 inches long. Fold it into 4 equal parts. Use your ruler to find the length of each part. How much is 3 inches $\div$ 4?

5. Explain how to fold a piece of paper 6 inches long so that you can show that 6 inches $\div$ 8 is $\frac{3}{4}$ inch.

Divide. Reduce the answers to lowest terms:

	a	*b*	*c*	*d*
6.	2 $\div$ 4 =	3 $\div$ 6 =	4 $\div$ 6 =	3 $\div$ 4 =
7.	4 $\div$ 8 =	5 $\div$ 8 =	12 $\div$ 16 =	18 $\div$ 24 =

8. Jennie has a piece of cloth 2 yards long. She wishes to cut it into 6 equal pieces. How long should each piece be?

9. If an automobile goes 8 miles in 10 minutes, how many miles does it go in a minute? THINK: 8 $\div$ 10 = ?

ADDING MIXED NUMBERS

It is $2\frac{1}{4}$ miles from John's home to the lake and $1\frac{1}{4}$ miles farther to the beach. How far is it from his home to the beach?

1. The drawing shows that the distance was $3\frac{1}{2}$ miles.

2. To find the sum of $2\frac{1}{4}$ and $1\frac{1}{4}$, do the work as follows:

$$\begin{array}{r} 2\frac{1}{4} \\ +1\frac{1}{4} \\ \hline 3\frac{2}{4} = 3\frac{1}{2} \end{array}$$

First add $\frac{1}{4}$ and $\frac{1}{4}$. Write $\frac{2}{4}$.
Then add 2 and 1. Write 3.
You know that $\frac{2}{4}$ equals $\frac{1}{2}$.
So change $3\frac{2}{4}$ to $3\frac{1}{2}$.

Numbers like $2\frac{1}{4}$ are called **mixed numbers.** They contain a whole number and a fraction. Why is this a good name for such numbers?

3. Study the examples below. Are the sums correct?

a. $\begin{array}{r} 3\frac{1}{3} \\ 2\frac{1}{3} \\ \hline 5\frac{2}{3} \end{array}$ *b.* $\begin{array}{r} 4\frac{1}{8} \\ 5\frac{3}{8} \\ \hline 9\frac{4}{8} = 9\frac{1}{2} \end{array}$ *c.* $\begin{array}{r} 5\frac{1}{6} \\ \frac{3}{6} \\ \hline 5\frac{4}{6} = 5\frac{2}{3} \end{array}$ *d.* $\begin{array}{r} \frac{2}{5} \\ 6\frac{2}{5} \\ \hline 6\frac{4}{5} \end{array}$

In adding mixed numbers, first add the fractions; then add the whole numbers. Reduce the fraction in the answer to lowest terms.

4. Copy the four examples in 3 and work them with your book closed. Compare your work with the work above.

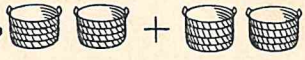
5. Express in simplest form: $8\frac{2}{8}$; $9\frac{3}{6}$; $6\frac{8}{10}$; $7\frac{6}{8}$; $4\frac{2}{4}$.

Find the sums:

	a	*b*	*c*	*d*	*e*	*f*	*g*
6.	$3\frac{2}{4}$ $2\frac{1}{4}$	$4\frac{1}{8}$ $2\frac{3}{8}$	$7\frac{1}{3}$ $6\frac{1}{3}$	$5\frac{1}{6}$ $2\frac{1}{6}$	$6\frac{1}{2}$ $5\frac{1}{2}$	$7\frac{1}{8}$ $2\frac{1}{8}$	$6\frac{5}{8}$ $3\frac{1}{8}$
7.	$7\frac{1}{5}$ $4\frac{2}{5}$	$8\frac{1}{10}$ $7\frac{3}{10}$	$5\frac{1}{4}$ $\frac{2}{4}$	$3\frac{1}{8}$ $\frac{1}{8}$	$4\frac{1}{3}$ $\frac{1}{3}$	$\frac{1}{8}$ $5\frac{3}{8}$	$\frac{1}{4}$ $6\frac{1}{4}$

ADDING WHOLE NUMBERS AND FRACTIONS

1. Jean picked $1\frac{3}{4}$ bushels of beans on Monday and 2 bushels on Tuesday. How many did she pick in all on the two days?

THINK: $1\frac{3}{4}$ bu. + 2 bu. = ? 

$1\frac{3}{4}$ There is nothing to add to $\frac{3}{4}$. So write $\frac{3}{4}$.
2 The sum of 1 and 2 is 3.
$3\frac{3}{4}$ Jean picked $3\frac{3}{4}$ bushels of beans.

2. Show that these sums are correct:

a.	*b.*	*c.*	*d.*
3	$\frac{1}{2}$	$6\frac{7}{8}$	5
$1\frac{3}{5}$	4	2	$\frac{2}{3}$
$4\frac{3}{5}$	$4\frac{1}{2}$	$8\frac{7}{8}$	$5\frac{2}{3}$

3. Copy, and work the examples with your book closed. Find the sums:

	a	*b*	*c*	*d*	*e*	*f*	*g*
4.	5	$2\frac{1}{4}$	$\frac{3}{5}$	$4\frac{1}{8}$	$\frac{1}{8}$	$2\frac{1}{2}$	5
	$1\frac{1}{4}$	3	2	2	3	3	$4\frac{1}{4}$
5.	$9\frac{1}{3}$	$6\frac{1}{2}$	8	7	6	6	$5\frac{1}{3}$
	8	3	$\frac{3}{4}$	$8\frac{1}{2}$	$5\frac{2}{3}$	$7\frac{7}{8}$	3

Mixed Practice

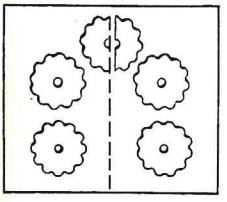
Add these numbers:

1.	$\frac{1}{3}$	$3\frac{1}{3}$	$\frac{3}{8}$	$\frac{2}{4}$	$2\frac{1}{8}$	9	$5\frac{1}{2}$
	$\frac{1}{3}$	$2\frac{1}{3}$	$\frac{3}{8}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{4}$	3
2.	$2\frac{1}{8}$	$\frac{1}{4}$	$3\frac{1}{6}$	$3\frac{1}{4}$	9	$6\frac{3}{8}$	8
	3	$\frac{1}{4}$	$3\frac{1}{6}$	$2\frac{1}{4}$	$7\frac{5}{8}$	$7\frac{1}{8}$	$\frac{4}{5}$

WRITING REMAINDERS AS FRACTIONS

1. Two boys have 5 cookies which they wish to divide equally. How many cookies should each boy get?

THINK: $5 \div 2 = ?$



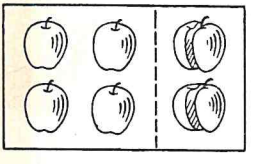
$$\begin{array}{r} 2 \\ 2\overline{)5} \\ \underline{4} \\ 1 \end{array} = \begin{array}{r} 2\frac{1}{2} \\ 2\overline{)5} \\ \underline{4} \\ 1 \end{array}$$

Each boy gets 2 whole cookies and there is one remaining. If the two boys divide the one cookie, each gets $\frac{1}{2}$ of it. You can see that $1 \div 2 = \frac{1}{2}$.

Each boy gets $2\frac{1}{2}$ cookies.

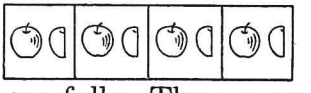
2. If 6 apples are shared by 4 boys, how many apples does each boy receive?

THINK: $6 \div 4 = ?$



$$\begin{array}{r} 1\frac{2}{4} \\ 4\overline{)6} \\ \underline{4} \\ 2 \end{array} = 1\frac{1}{2}$$

Each boy gets 1 apple and there are 2 apples left. Two whole apples make 4 half apples. $2 \div 4 = \frac{2}{4}$. Reduce $\frac{2}{4}$ to $\frac{1}{2}$.



Each boy receives $1\frac{1}{2}$ apples.

3. Study the following examples carefully. Then copy the examples and work them with your book closed.

a. $\begin{array}{r} 1\frac{2}{3} \\ 3\overline{)5} \\ \underline{3} \\ 2 \end{array}$ b. $\begin{array}{r} 2\frac{2}{6} = 2\frac{1}{3} \\ 6\overline{)14} \\ \underline{12} \\ 2 \end{array}$ c. $\begin{array}{r} 1\frac{4}{8} = 1\frac{1}{2} \\ 8\overline{)12} \\ \underline{8} \\ 4 \end{array}$

Divide. Express the remainder in the form of a fraction.

	a	*b*	*c*	*d*	*e*	*f*
4.	$4\overline{)6}$	$5\overline{)23}$	$6\overline{)27}$	$4\overline{)302}$	$7\overline{)482}$	$4\overline{)30}$
5.	$9\overline{)30}$	$6\overline{)14}$	$8\overline{)547}$	$8\overline{)28}$	$5\overline{)423}$	$6\overline{)351}$
6.	$\frac{204}{8}$	$\frac{146}{7}$	$\frac{82}{4}$	$\frac{282}{9}$	$\frac{927}{6}$	$\frac{324}{5}$

CLIMBING MT. WHITNEY

Three boys, John, Keith, and Dick, climbed to the top of Mt. Whitney in California, the highest mountain in the United States.

1. The height of a mountain is measured by the distance above sea level. The top of this mountain is 14,496 feet above sea level. Is this mountain more or less than 3 miles high? How much?

2. The boys rode in their automobile to a place on the side of the mountain 8,100 feet high. Here they slept the night before they started to climb to the top of the mountain. How much lower than the summit (top) was the place where they slept?

3. To get to the top the boys had to walk in all about 15 miles up the side of the mountain on a winding path. They started climbing at 6 o'clock in the morning and did not reach the top until 1 o'clock. How many hours did they climb? How many miles did they average an hour? Do you think it was easy to climb the mountain?

FINDING AVERAGES

1. Helen weighed 6 eggs and found that they weighed 10 ounces. Find the average weight of the eggs.

THINK: 10 oz. ÷ 6 = ?

2. For supper a family ate 4 pork chops that weighed in all 18 ounces. Find the average weight of the pork chops. Do you think that all of the chops weighed exactly the same?

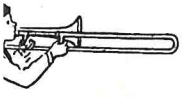
3. A farmer sold 8 chickens. They weighed in all 42 pounds. Find the average weight of the chickens.

4. George caught 3 fish. They weighed 5 pounds, 3 pounds, and 4 pounds. Find their average weight.

5. An airplane flew a distance of 25 miles in 6 minutes. How many miles did it fly a minute? Do you think that the airplane flew at the average speed each of the six minutes?

6. Jack ran 50 yards in 8 seconds. How many yards was that a second?

*7. Find the average age of 4 children in your room. Find also their average height and their average weight.



LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$\begin{array}{r} 7984 \\ -2896 \\ \hline \end{array}$	$\begin{array}{r} 26 \\ \times 30 \\ \hline \end{array}$	$7\overline{)5873}$	$\frac{1}{2}$ of 48 =	$\begin{array}{r} \$.25 \\ \times 10 \\ \hline \end{array}$
2.	$\begin{array}{r} \frac{1}{4} \\ +\frac{1}{4} \\ \hline \end{array}$	$9\overline{)8478}$	$\begin{array}{r} 68 \\ \times 27 \\ \hline \end{array}$	$\begin{array}{r} \frac{3}{8} \\ +\frac{1}{8} \\ \hline \end{array}$	$\begin{array}{r} 4001 \\ -2068 \\ \hline \end{array}$
3.	$\begin{array}{r} \$2.64 \\ \times 48 \\ \hline \end{array}$	$\begin{array}{r} \$87.50 \\ -7.50 \\ \hline \end{array}$	Reduce $\frac{6}{8}$	$4\overline{)321}$	$\begin{array}{r} 2\frac{2}{5} \\ +5\frac{2}{5} \\ \hline \end{array}$

4. Find the sum of \$7.65, \$.48, \$4.20, and \$.08.

4. It was quite cold at the top. The boys estimated that the temperature at the top was about 40 degrees above zero. How much above freezing was this?

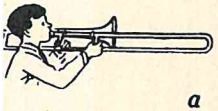
5. They started down at 1:45 o'clock. They lost the trail and had to climb down the mountain side toward the lake where their car was. This climb was very dangerous. They reached their car at 4:45 o'clock. How long did it take them to climb down the mountain to their car?

6. How much longer did it take them to climb up than to climb down?

7. Mt. Everest, the highest mountain in the world, is 29,141 feet high. No one has ever climbed to the top of it. How much higher than Mt. Whitney is Mt. Everest?

*8. Find the name of the highest mountains in North and South America.

*9. The lowest spot in North America, Death Valley, is near Mt. Whitney. It is 280 feet below sea level. Find the difference between the top of Mt. Whitney and the floor of Death Valley.



LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$\frac{1}{4}$ $+\frac{1}{4}$	87 $\times 30$	$6\overline{)21}$	$8\overline{)6243}$	$\frac{5}{8}$ $+\frac{1}{8}$
2.	7815 -7796	Reduce $\frac{6}{12}$	$3\frac{1}{3}$ $+2\frac{1}{3}$	\$3.75 $\times 94$	\$67.04 -49.08
3.	$7\overline{)6776}$	$4\frac{3}{8}$ $+1\frac{3}{8}$	96 $\times 48$	$4 \div 8 =$	$6\overline{)5442}$

4. Add: \$78.40, \$.05, \$4.67, and \$.96.

DIAGNOSTIC TEST IN ADDING LIKE FRACTIONS

This test will help you to find out how well you have learned to add like fractions. Be sure to reduce all fractions to lowest terms. Work carefully.

	a	*b*	*c*	*d*	*e*	
1.	$\frac{1}{3}$ $\frac{1}{3}$	$\frac{1}{5}$ $\frac{1}{5}$	$\frac{1}{4}$ $\frac{2}{4}$	$\frac{4}{8}$ $\frac{1}{8}$	$\frac{1}{6}$ $\frac{4}{6}$	(91)
2.	$\frac{1}{4}$ $\frac{1}{4}$	$\frac{1}{8}$ $\frac{1}{8}$	$\frac{5}{8}$ $\frac{1}{8}$	$\frac{3}{8}$ $\frac{3}{8}$	$\frac{1}{6}$ $\frac{1}{6}$	(98)
3.	$2\frac{1}{5}$ $2\frac{2}{5}$	$3\frac{1}{3}$ $7\frac{1}{3}$	$5\frac{3}{8}$ $\frac{2}{8}$	$\frac{1}{6}$ $3\frac{4}{6}$	$7\frac{3}{10}$ $\frac{6}{10}$	(102)
4.	$3\frac{3}{8}$ $2\frac{1}{8}$	$4\frac{1}{4}$ $8\frac{1}{4}$	$9\frac{1}{6}$ $7\frac{1}{6}$	$7\frac{1}{8}$ $\frac{5}{8}$	$\frac{3}{10}$ $6\frac{1}{10}$	(102)
5.	$4\frac{1}{2}$ 2	$3\frac{1}{8}$ 4	7 $6\frac{3}{4}$	9 $5\frac{2}{3}$	4 $\frac{3}{4}$	(103)

If you miss only one or two examples in a row, correct your mistakes at once. If you have errors in three or more examples in a row, turn to the pages indicated at the end of the row for help. Then rework all of the examples that were incorrect. If you need more help, ask your teacher to help you.

*INTERESTING FACTS TO FIND OUT

If you do not need to practice addition of fractions, choose one of the topics given below and prepare a report on it.

1. How long have people used fractions?
2. What fractions are used in industry?
3. What fractions can you find in newspapers?
4. Some ways in which boys and girls use fractions.
5. How fractions help us to measure more exactly.

*QUICK THINKING IN ARITHMETIC

1. Look at the subtraction example at the right. If you subtract a larger number than 20 from 94, will the remainder be more or will it be less than 74? Prove your answer.

$$\begin{array}{r} 94 \\ -20 \\ \hline 74 \end{array}$$

2. If you subtract a smaller number than 20 from 94, what happens to the remainder?

3. If you make 94 larger but do not change the 20, what happens to the remainder? What happens to the remainder if you make 94 smaller?

4. Look at the multiplication example at the right. If you multiply 76 by a number larger than 4, what happens to the product? If you multiply 76 by a number smaller than 4, what happens to the product?

$$\begin{array}{r} 76 \\ \times 4 \\ \hline 304 \end{array}$$

5. If you make 76 larger but do not change the 4, what happens to the product? If you make 76 smaller but do not change the 4, what happens to the product?

6. What happens to the product if you increase both 76 and 4?

7. What happens to the product when you make both 76 and 4 smaller?

8. Suppose that you make the 76 larger and the 4 smaller, what would happen to the product?

$$\begin{array}{r} 18 \\ \hline 5)90 \end{array}$$

9. What happens to the quotient of the example at the right if you increase the 5? If you divide 90 by a number smaller than 5, what happens to the quotient?

$$\begin{array}{r} 5 \\ \hline 40 \\ 40 \\ \hline \end{array}$$

10. If you increase the 90 but do not change the 5, what happens to the quotient? If you decrease the 90, what happens to the quotient?

ALFRED GOES TO CHICAGO

Alfred lives in Omaha. He is going to visit his grandmother who lives in Chicago. He wants to go on the train pictured above. It is a very fast train.

He and his father used the time table at the right to find out some things about Alfred's trip.

MI.	STATION	STREAMLINER
0	Omaha	lv.1:35 P.M.
148	Boone	lv.3:55
269	Cedar Rapids	lv.5:45
350	Clinton	ar.7:05
488	Chicago	ar.9:23

1. The column at the left headed "Mi." tells how far each station is from Omaha. How many miles is it from Omaha to Chicago? From Omaha to Cedar Rapids?

2. When Alfred arrives at Cedar Rapids, how much farther will he still have to travel before he reaches Chicago?

3. At what time does the train leave Omaha? At what time does it reach Chicago? Does this train leave in the morning or in the afternoon?

4. How long does it take the train to go from Omaha to Chicago?

5. Counting 8 hours as the time it takes to make the trip, how many miles does the train average an hour?

6. The train Alfred went on reached Clinton at 7:20. How many minutes late was it?

7. At 2 cents a mile what is the regular railroad fare from Omaha to Chicago?

8. Alfred is 10 years old and had to pay only half of the regular fare. How much did he pay a mile? At this rate how much would his fare be to and from Chicago?

9. Alfred's father told him that the full round-trip fare to and from Chicago on an "excursion" was only $10.00. How much would Alfred's fare be each way? How much less than the regular fare each way was this?

*10. Secure a time table. Use it to find the distance to some city you would like to visit. Find when trains going to this place leave your home. Find the regular fare to this place. Find out if there ever are reduced fares.

*11. Is the fare a mile the same in a Pullman and in a day coach? Find out about the cost of a berth in a Pullman.

*12. Find out if railroad fares were ever more than they are now. What is meant by "commuters' tickets"? Railroads often have "special rates" for round trips. Find out what is meant by "special rates."

A TEST IN ADDING FRACTIONS

How many of these examples can you work correctly?

	a	*b*	*c*	*d*	*e*	*f*
1.	$\frac{1}{3}$ $\frac{1}{3}$	$\frac{1}{4}$ $\frac{1}{4}$	$\frac{3}{8}$ $\frac{1}{8}$	$6\frac{3}{8}$ $5\frac{3}{8}$	7 $2\frac{1}{2}$	$9\frac{1}{4}$ 8
2.	$7\frac{1}{5}$ $\frac{1}{5}$	$8\frac{1}{8}$ $\frac{3}{8}$	6 $\frac{3}{4}$	$\frac{5}{6}$ 7	$4\frac{1}{6}$ $5\frac{1}{6}$	$9\frac{1}{2}$ 7

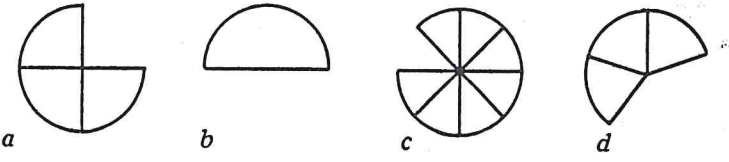
Correct at once any errors you made on this test. Be sure that you know how to work every example.

READINESS TEST FOR SUBTRACTING FRACTIONS

I. How well can you add fractions? Find the sums:

	a	*b*	*c*	*d*	*e*	*f*
1.	$\frac{1}{3}$ $\frac{1}{3}$	$\frac{3}{8}$ $\frac{2}{8}$	$\frac{1}{4}$ $\frac{1}{4}$	7 $\frac{3}{4}$	$8\frac{2}{4}$ $7\frac{1}{4}$	$\frac{3}{8}$ $\frac{3}{8}$
2.	$2\frac{1}{2}$ 9	$\frac{1}{6}$ $\frac{4}{6}$	7 $3\frac{1}{4}$	$8\frac{1}{6}$ $\frac{1}{6}$	$9\frac{2}{5}$ $\frac{2}{5}$	$6\frac{3}{8}$ $9\frac{1}{8}$

II. Naming missing parts of circles



What part is missing in circle *a*? in circle *b*? in circle *c*? in circle *d*?

III. Using lines to subtract

1. How long is the line at the right if each part —|—|— is $\frac{1}{4}$ inch long?

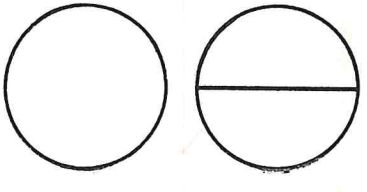
2. If you cover one of the parts of the line, how long is the part of the line that is not covered? $\frac{3}{4}$ inch minus $\frac{1}{4}$ inch equals how many fourths inch?

3. Use the line to show $\frac{3}{4}$ inch $-$ $\frac{2}{4}$ inch $=$ $\frac{1}{4}$ inch.

4. With your ruler draw a line $1\frac{3}{4}$ inches long. Then erase $\frac{3}{4}$ inch of the line. How long is the line that is left?

5. Draw a line $1\frac{1}{4}$ inches long. Divide it into parts $\frac{1}{4}$ inch long. $1\frac{1}{4}$ inches $=$ how many $\frac{1}{4}$ inches?

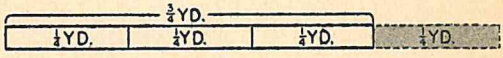
6. The circles at the right show that $2 = 1\frac{2}{2}$. Use circles to show that $2 = 1\frac{4}{4}$.



SUBTRACTING LIKE FRACTIONS

1. June had a ribbon $\frac{3}{4}$ yard long. She cut off a piece $\frac{1}{4}$ yard long. How long was the piece of ribbon that was left?

THINK: $\frac{3}{4}$ yd. $-$ $\frac{1}{4}$ yd. $=$?



$\frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$

Three fourths $-$ one fourth $=$ two fourths, just as 3 apples $-$ 1 apple $=$ 2 apples. Reduce $\frac{2}{4}$ to lowest terms. $\frac{2}{4} = \frac{1}{2}$ $\frac{1}{2}$ yd. of ribbon was left.

2. Study the examples below carefully.

a. $\frac{7}{8} - \frac{4}{8} = \frac{3}{8}$ *b.* $\frac{5}{8} - \frac{1}{8} = \frac{4}{8} = \frac{1}{2}$ *c.* $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$ *d.* $\frac{5}{6} - \frac{2}{6} = \frac{3}{6} = \frac{1}{2}$ *e.* $\frac{1}{4} - \frac{1}{4} = \frac{0}{4} = 0$

3. Copy the five examples and work them with your book closed. Then compare your work with the work above.

In subtracting like fractions (1) subtract the numerators, (2) write the difference over their denominator, (3) be sure that you express the answer in its simplest form.

Subtract. Reduce where necessary:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
4.	$\frac{5}{8}$ $\frac{3}{8}$	$\frac{3}{4}$ $\frac{2}{4}$	$\frac{5}{6}$ $\frac{1}{6}$	$\frac{7}{8}$ $\frac{1}{8}$	$\frac{3}{4}$ $\frac{1}{4}$	$\frac{3}{6}$ $\frac{1}{6}$	$\frac{4}{5}$ $\frac{3}{5}$	$\frac{2}{4}$ $\frac{1}{4}$
5.	$\frac{5}{6}$ $\frac{3}{6}$	$\frac{3}{8}$ $\frac{1}{8}$	$\frac{4}{5}$ $\frac{2}{5}$	$\frac{2}{3}$ $\frac{2}{3}$	$\frac{3}{8}$ $\frac{3}{8}$	$\frac{1}{2}$ $\frac{1}{2}$	$\frac{7}{8}$ $\frac{3}{8}$	$\frac{3}{4}$ $\frac{3}{4}$

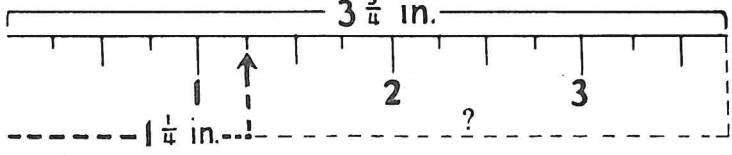
6. John lives $\frac{7}{8}$ mile from school. Alice lives $\frac{1}{8}$ mile from school. How much nearer the school than John lives does Alice live?

7. Draw a line $\frac{7}{8}$ inch long. Cover $\frac{3}{8}$ inch with a card. How long is the part of the line that is not covered?

8. How much less than $\frac{5}{8}$ inch is $\frac{3}{8}$ inch?

SUBTRACTING MIXED NUMBERS

1. Draw a line $3\frac{3}{4}$ inches long. Place a mark $1\frac{1}{4}$ inches from one end of the line. How long is the other part of the line?



You may work this example this way:

$$\begin{array}{r} 3\frac{3}{4} \\ -1\frac{1}{4} \\ \hline 2\frac{2}{4} = 2\frac{1}{2} \end{array}$$

THINK: $3\frac{3}{4}$ in. $- 1\frac{1}{4}$ in. $= ?$
First subtract the fractions: $\frac{3}{4} - \frac{1}{4} = \frac{2}{4}$
Then subtract the whole numbers: $3 - 1 = 2$
Change $2\frac{2}{4}$ to $2\frac{1}{2}$ by reducing $\frac{2}{4}$ to $\frac{1}{2}$.

2. Study the following examples carefully:

a. $9\frac{2}{3} - 2\frac{1}{3} = 7\frac{1}{3}$ *b.* $6\frac{7}{8} - 2\frac{3}{8} = 4\frac{4}{8} = 4\frac{1}{2}$ *c.* $8\frac{3}{4} - 8\frac{1}{4} = \frac{2}{4} = \frac{1}{2}$ *d.* $8\frac{5}{6} - \frac{1}{6} = 8\frac{4}{6} = 8\frac{2}{3}$

3. Copy, and work the examples with your book closed. Subtract, and reduce to lowest terms when necessary:

	a	*b*	*c*	*d*	*e*	*f*	*g*
4.	$8\frac{3}{4} - 2\frac{1}{4}$	$4\frac{2}{3} - 2\frac{1}{3}$	$8\frac{5}{6} - \frac{2}{6}$	$7\frac{5}{8} - 6\frac{1}{8}$	$6\frac{3}{4} - 2\frac{1}{4}$	$5\frac{5}{8} - 1\frac{4}{8}$	$7\frac{3}{8} - \frac{1}{8}$
5.	$6\frac{3}{8} - 4\frac{2}{8}$	$6\frac{2}{5} - \frac{2}{5}$	$5\frac{3}{4} - 5\frac{1}{4}$	$12\frac{7}{8} - 6\frac{3}{8}$	$5\frac{1}{6} - \frac{1}{6}$	$7\frac{3}{4} - 4\frac{2}{4}$	$9\frac{5}{6} - 2\frac{1}{6}$
6.	$4\frac{7}{8} - \frac{1}{8}$	$9\frac{3}{4} - 5\frac{2}{4}$	$7\frac{5}{8} - \frac{2}{8}$	$15\frac{5}{6} - 9\frac{1}{6}$	$13\frac{7}{8} - 6\frac{1}{8}$	$12\frac{2}{3} - 5\frac{1}{3}$	$9\frac{7}{8} - 6\frac{5}{8}$
7.	$9\frac{5}{6} - 4\frac{3}{6}$	$15\frac{4}{5} - 6\frac{2}{5}$	$3\frac{3}{8} - \frac{1}{8}$	$7\frac{3}{4} - 2\frac{2}{4}$	$2\frac{5}{8} - \frac{1}{8}$	$28\frac{3}{4} - 13\frac{1}{4}$	$8\frac{5}{8} - 8\frac{1}{8}$

8 Arthur can swim 50 yards in $39\frac{4}{5}$ seconds. John can swim 50 yards in $35\frac{1}{5}$ seconds. In how many seconds less than Arthur can John swim 50 yards?

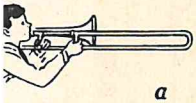
HOW FAST CAN YOU RUN?

1. One of the field-day sports was the 50-yard dash. The children wanted to see who could run 50 yards most quickly. Stanley ran the distance in $8\frac{1}{5}$ seconds. Charles ran it in $9\frac{3}{5}$ seconds. How much less time did it take Stanley than it took Charles?

2. The fastest of the girls was Patricia, who ran the 50 yards in $9\frac{2}{5}$ seconds. How much longer did it take her than it took Stanley?

*3. Measure a distance of 50 yards on your school playground or on the sidewalk. Then find how long it takes you to run 50 yards.

*4. What is a stop watch? What is it used for?



LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$3\frac{1}{4}$ $+7\frac{1}{4}$	6010 -4029	47 $\times 60$	$6\overline{)5442}$	$\frac{1}{3}$ $+\frac{1}{3}$
2.	$\frac{3}{4}$ $-\frac{1}{4}$	$4\frac{1}{8}$ $+3\frac{5}{8}$	Reduce $\frac{15}{20}$	\$3.60 $\times 95$	\$84.20 -27.08
3.	4 $+3\frac{4}{5}$	$5\overline{)4854}$	$4\frac{5}{8}$ $-2\frac{5}{8}$	$8\overline{)44}$	97 $\times 10$

4. Add 785, 27, 3486, and 9.

WATCHING ZEROS IN THE SUBTRACTION OF FRACTIONS

1. Margaret needs $3\frac{3}{4}$ cups of flour to make a cake. She has only $1\frac{3}{4}$ cups of flour. How much more flour must she get?

$$\begin{array}{r} 3\frac{3}{4} \\ -1\frac{3}{4} \\ \hline 2 \end{array}$$

THINK: $3\frac{3}{4}$ cups $- 1\frac{3}{4}$ cups $=$? cups.

Subtract the fractions: $\frac{3}{4} - \frac{3}{4} = 0$.

Do not write the 0 under the fractions.

Subtract 1 from 3.

Margaret must get 2 more cups of flour.

She needs

She has

She must get

2. Study the following examples carefully:

a.	*b.*	*c.*	*d.*	*e.*
$6\frac{1}{4}$	$4\frac{2}{3}$	$7\frac{1}{2}$	$4\frac{1}{5}$	$8\frac{3}{4}$
$4\frac{1}{4}$	$\frac{2}{3}$	$6\frac{1}{2}$	$4\frac{1}{5}$	$\frac{3}{4}$
2	4	1	0	8

3. If 0 was written under the fractions above, what would the answer be in each case? Is that answer correct?

In subtracting mixed numbers do not write zero under the fractions when the difference between the fractions is zero.

4. Copy and work the examples in 2.

Find the differences:

	a	*b*	*c*	*d*	*e*	*f*	*g*
5.	$5\frac{1}{2}$	$3\frac{2}{3}$	$8\frac{1}{4}$	$8\frac{3}{4}$	$6\frac{5}{8}$	$1\frac{2}{3}$	$2\frac{1}{4}$
	$4\frac{1}{2}$	$\frac{2}{3}$	$3\frac{1}{4}$	$8\frac{3}{4}$	$\frac{5}{8}$	$\frac{2}{3}$	$2\frac{1}{4}$
6.	$7\frac{1}{8}$	$6\frac{3}{4}$	$3\frac{1}{3}$	$4\frac{1}{4}$	$9\frac{1}{2}$	$7\frac{3}{8}$	$6\frac{5}{6}$
	$\frac{1}{8}$	$1\frac{3}{4}$	$\frac{1}{3}$	$2\frac{1}{4}$	$9\frac{1}{2}$	$\frac{3}{8}$	$3\frac{5}{6}$
7.	$5\frac{1}{4}$	$6\frac{3}{6}$	$\frac{5}{6}$	$9\frac{1}{4}$	$\frac{2}{3}$	$\frac{1}{2}$	$5\frac{5}{8}$
	$\frac{1}{4}$	$1\frac{1}{8}$	$\frac{1}{6}$	$9\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{2}$	$2\frac{1}{8}$

SUBTRACTING WHOLE NUMBERS FROM MIXED NUMBERS

1. Jane can reach a shelf $6\frac{1}{2}$ feet high. Bobby, her little brother, can only reach a shelf 4 feet high. How much higher can Jane reach than Bobby?

$$\begin{array}{r} 6\frac{1}{2} \\ -\,4 \\ \hline 2\frac{1}{2} \end{array}$$

THINK: $6\frac{1}{2}$ ft. $-$ 4 ft. $=$? ft.
There is no fraction to subtract from $\frac{1}{2}$. So write $\frac{1}{2}$.
Subtract 4 from 6. Write 2.
Jane can reach $2\frac{1}{2}$ feet higher than Bobby can.

2. Study the following subtraction examples carefully:

a.	*b.*	*c.*	*d.*	*e.*
$17\frac{1}{4}$	$38\frac{7}{8}$	$6\frac{2}{5}$	$8\frac{2}{3}$	$9\frac{5}{6}$
15	28	6	8	7
$2\frac{1}{4}$	$10\frac{7}{8}$	$\frac{2}{5}$	$\frac{2}{3}$	$2\frac{5}{6}$

In examples *c* and *d* we do not write the 0 in subtracting 6 from 6, or 8 from 8. Why?

3. Copy and work the examples with your book closed. Subtract:

	a	*b*	*c*	*d*	*e*	*f*	*g*
4.	$9\frac{1}{4}$	$7\frac{1}{2}$	$4\frac{2}{3}$	$3\frac{3}{8}$	$7\frac{3}{4}$	$8\frac{7}{8}$	$7\frac{4}{5}$
	4	3	4	1	7	2	5
5.	$4\frac{3}{4}$	$6\frac{2}{3}$	$8\frac{1}{3}$	$7\frac{3}{4}$	$6\frac{3}{4}$	$3\frac{1}{4}$	$9\frac{3}{5}$
	$1\frac{1}{4}$	$5\frac{1}{3}$	6	$\frac{3}{4}$	$6\frac{1}{4}$	3	$2\frac{1}{5}$
6.	$6\frac{2}{5}$	$8\frac{1}{8}$	$7\frac{7}{8}$	$5\frac{1}{2}$	$9\frac{1}{2}$	$6\frac{3}{8}$	$5\frac{3}{4}$
	6	$\frac{1}{8}$	$3\frac{5}{8}$	3	$4\frac{1}{2}$	$6\frac{1}{8}$	$1\frac{1}{4}$

MIXED PRACTICE ON FRACTIONS

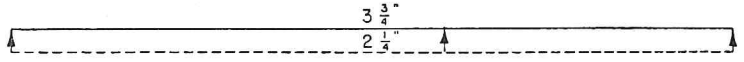
1. $\frac{7}{8} - \frac{1}{8} =$	4. $5\frac{3}{8} + 1\frac{1}{8} =$	7. $7\frac{1}{3} + 5\frac{1}{3} =$	10. $9\frac{1}{4} - 4\frac{1}{4} =$
2. $\frac{1}{4} + \frac{1}{4} =$	5. $6\frac{1}{2} - 4 =$	8. $6\frac{7}{8} - 5\frac{3}{8} =$	11. $8\frac{3}{8} + 6\frac{1}{8} =$
3. $\frac{1}{8} + \frac{1}{8} =$	6. $7\frac{3}{8} - \frac{3}{8} =$	9. $9\frac{1}{4} + \frac{1}{4} =$	12. $6\frac{4}{5} - 2\frac{2}{5} =$

PICTURING THE SUBTRACTION OF FRACTIONS

You can use a ruler to check your work in subtraction of some fractions. Study the work below carefully.

1. Subtract to find how much longer than a $2\frac{1}{4}$-inch line a line $3\frac{3}{4}$ inches long is.

2. To find if your answer is correct, draw a line $3\frac{3}{4}$ inches long. $3\frac{3}{4}''$ means $3\frac{3}{4}$ inches. From one end of the line mark off $2\frac{1}{4}$ inches on the line as shown below. Measure the other part of the line. How long is it? Is the number the same as the answer to the first problem?



3. Subtract $1\frac{1}{4}$ from $2\frac{3}{4}$. Then draw a line as explained in problem 2 to show that your answer is correct.

4. Draw a line $2\frac{5}{8}$ inches long. Cover $1\frac{1}{8}$ inches of the line with a card. How long is the part of the line that is not covered? Find the answer to the problem in two ways.

5. First subtract the numbers in these examples. Then use lines drawn with a ruler to find if your answers are correct.

a. $1\frac{3}{4}'' - \frac{1}{4}'' =$ *c.* $2\frac{1}{2}'' - 1\frac{1}{2}'' =$ *e.* $2\frac{7}{8}'' - 1\frac{3}{8}'' =$

b. $\frac{3}{4}'' - \frac{1}{4}'' =$ *d.* $3\frac{3}{4}'' - 2'' =$ *f.* $2\frac{1}{4}'' - 1\frac{1}{4}'' =$

6. Here are two lines. How much longer than line *a* is line *b*? Tell several ways in which you can find the answer.

a _____

b _____

7. Cut a narrow strip of paper $3\frac{1}{2}$ inches long. Then cut off a piece of the paper $1\frac{1}{2}$ inches long. Measure the length of the piece that is left. Show by subtracting on your paper that the answer to the example, $3\frac{1}{2}'' - 1\frac{1}{2}''$, and the length of the paper that is left are the same.

DIAGNOSTIC TEST IN SUBTRACTION OF FRACTIONS

Work these examples carefully. Copy the examples so as to leave enough space for your work. Be sure to reduce all fractions in the answers.

	a	*b*	*c*	*d*	*e*	*f*	
1.	$\frac{2}{3}$ $\frac{1}{3}$	$\frac{3}{5}$ $\frac{1}{5}$	$\frac{5}{6}$ $\frac{5}{6}$	$\frac{4}{5}$ $\frac{2}{5}$	$\frac{7}{8}$ $\frac{7}{8}$	$\frac{3}{4}$ $\frac{3}{4}$	(113)
2.	$\frac{3}{4}$ $\frac{1}{4}$	$\frac{7}{8}$ $\frac{1}{8}$	$\frac{5}{6}$ $\frac{1}{6}$	$\frac{7}{8}$ $\frac{5}{8}$	$\frac{9}{10}$ $\frac{3}{10}$	$\frac{5}{8}$ $\frac{1}{8}$	(113)
3.	$8\frac{2}{3}$ $\frac{1}{3}$	$7\frac{4}{5}$ $\frac{2}{5}$	$8\frac{7}{8}$ $\frac{4}{8}$	$9\frac{3}{4}$ $8\frac{2}{4}$	$5\frac{7}{10}$ $\frac{6}{10}$	$6\frac{5}{6}$ $\frac{4}{6}$	(114)
4.	$7\frac{3}{4}$ $2\frac{1}{4}$	$8\frac{7}{8}$ $5\frac{3}{8}$	$6\frac{5}{6}$ $\frac{1}{6}$	$5\frac{7}{8}$ $2\frac{5}{8}$	$7\frac{5}{8}$ $\frac{1}{8}$	$4\frac{5}{6}$ $2\frac{3}{6}$	(114)
5.	$2\frac{1}{8}$ $\frac{1}{8}$	$8\frac{1}{4}$ $5\frac{1}{4}$	$4\frac{2}{3}$ $\frac{2}{3}$	$5\frac{7}{10}$ $5\frac{7}{10}$	$4\frac{1}{2}$ $3\frac{1}{2}$	$6\frac{3}{8}$ $6\frac{3}{8}$	(116)
6.	$8\frac{1}{2}$ 6	$15\frac{3}{4}$ 10	$9\frac{7}{10}$ 9	$24\frac{1}{2}$ 14	$8\frac{3}{5}$ 8	$32\frac{1}{3}$ 28	(117)

If you have errors in one or two examples in a row, correct your errors at once. If you have errors in three or more examples in any row, turn for review and help on hard spots to the pages indicated at the right of the row. If you need more help, ask your teacher to help you. Then rework the examples you had incorrect on the test. Do not be satisfied until you can work every example quickly and easily.

CHECKING UP ON YOUR WORK

It would be a good plan to repeat the diagnostic test in addition of fractions on page 108. Work only the first two examples in each row. If you have difficulty, review the necessary work and complete all of the examples in the row.

SUBSCRIBING FOR MAGAZINES

Mrs. Anderson wishes to give a magazine to John and Anne for a Christmas present. Here are the prices of some magazines for which she can subscribe. The costs of subscriptions for the magazines for one year, two years, and three years are given.

Magazine	One Year	Two Years	Three Years
Boys' Monthly	$1.75	$2.80	$3.75
Girls' Weekly	$2.00	$3.50	$4.50
Camping Life	$1.25	$2.10	$3.00
Air Fliers	$ .90	$1.60	$2.10

1. For which of these magazines is the cost of a one-year subscription least?
2. For which is the cost of a one-year subscription most?
3. What is the cost of *Boys' Monthly* if Mrs. Anderson subscribes for it now for two years? How much is this a year?
4. What is the cost a year for *Boys' Monthly* if subscribed for now for three years?
5. How much less a year than the rate for a one-year subscription for *Boys' Monthly* is the rate a year for a two-year subscription? for a three-year subscription?
6. How much would Mrs. Anderson save in two years if she subscribed for *Boys' Monthly* for two years now, instead of for one year now and for another year next Christmas?

7. How much less than two one-year subscriptions for *Girls' Weekly* is a two-year subscription?

8. How much more do three one-year subscriptions for *Camping Life* cost than one three-year subscription costs?

9. Which is cheaper for *Air Fliers*, a two-year subscription and a one-year subscription, or one three-year subscription? How much cheaper?

10. *Camping Life*, a monthly magazine, sells for 15 cents a copy at newsstands. How much do the numbers for one year cost if bought at newsstands? How much more than the one-year subscription rate is this?

*11. Why do magazines often give reduced rates for subscriptions for more than one year? Find out about the subscription rates for some magazines boys and girls read. What is meant by "club rates"?

TEST ON SUBTRACTING FRACTIONS

If you can work all of these subtraction examples correctly, you have learned very well the work you have had in subtraction of fractions.

	a	*b*	*c*	*d*	*e*	*f*
1.	$\frac{3}{4}$ $\frac{1}{4}$	$\frac{4}{5}$ $\frac{3}{5}$	$\frac{1}{3}$ $\frac{1}{3}$	$\frac{7}{8}$ $\frac{3}{8}$	$\frac{1}{2}$ $\frac{1}{2}$	$\frac{5}{6}$ $\frac{1}{6}$
2.	$8\frac{1}{2}$ 4	$7\frac{3}{4}$ $5\frac{1}{4}$	$6\frac{4}{5}$ $3\frac{2}{5}$	$7\frac{2}{3}$ 7	$9\frac{7}{8}$ $2\frac{5}{8}$	$8\frac{1}{2}$ $8\frac{1}{2}$
3.	$9\frac{3}{4}$ $\frac{1}{4}$	$6\frac{2}{3}$ $\frac{2}{3}$	$6\frac{3}{4}$ 4	$8\frac{4}{5}$ $2\frac{3}{5}$	$7\frac{1}{4}$ $5\frac{1}{4}$	$6\frac{5}{6}$ $4\frac{1}{6}$
4.	$8\frac{1}{4}$ 3	$7\frac{1}{3}$ 5	$9\frac{1}{2}$ $3\frac{1}{2}$	$5\frac{3}{8}$ $1\frac{1}{8}$	$4\frac{3}{5}$ $2\frac{2}{5}$	$8\frac{2}{3}$ $1\frac{1}{3}$

JOYCE NEEDS A NEW DRESS

Mother is helping Joyce choose a pattern and the cloth for a new dress. She explains to Joyce that cloth comes in different widths. The wider a kind of cloth is, the more it usually costs, and the shorter is the piece that is needed for a dress.

1. The pattern for Joyce's new dress calls for $3\frac{3}{4}$ yards of 32-inch material or $3\frac{1}{4}$ yards of 36-inch material. How much longer than the 36-inch material is the piece of 32-inch material that is needed? Why is more 32-inch material needed?

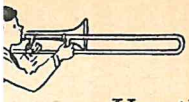
2. If 40-inch cloth is used for Joyce's dress, only 3 yards of material are needed. How much less 40-inch cloth than 32-inch cloth is needed?

3. Joyce's mother bought 3 yards of 40-inch cloth at \$.50 a yard. She had to pay the dressmaker \$2.70 for making the dress, including the cost of thread and buttons. How much did Joyce's dress cost?

4. Joyce's mother has one piece of 40-inch material that is $2\frac{1}{4}$ yards long. How much more of this kind of cloth does she need for a dress for Joyce?

5. She also has a piece of 32-inch cloth $2\frac{3}{4}$ yards long. How much more of this kind of cloth would she need for a dress for Joyce?

*6. Find the widths in which various kinds of cloth are made, such as wool, cotton, linen, and silk.



LET'S PRACTICE

Use these sets of examples for practice on three days. Use one set a day. Check your work. For extra practice you may work the same set of examples on three different days.

Set I

1. $\begin{array}{r} 889 \\ 33 \\ 35 \\ 8645 \\ 86 \\ 8 \\ \hline \end{array}$

2. $\begin{array}{r} 6839 \\ -2986 \\ \hline \end{array}$

3. $\begin{array}{r} 798 \\ \times 60 \\ \hline \end{array}$

4. $8\overline{)5401}$

5. $\begin{array}{r} 9\frac{1}{4} \\ +7\frac{1}{4} \\ \hline \end{array}$

6. $\frac{1}{3}$ of 15 =

7. $\begin{array}{r} \frac{3}{4} \\ -\frac{1}{4} \\ \hline \end{array}$

8. $8\overline{)28}$

9. $\begin{array}{r} 4\frac{5}{8} \\ -2\frac{3}{8} \\ \hline \end{array}$

10. $\begin{array}{r} 5\frac{1}{2} \\ +4 \\ \hline \end{array}$

Set II

1. $\begin{array}{r} \$5.68 \\ .06 \\ 3.98 \\ .44 \\ 4.33 \\ 96.81 \\ \hline \end{array}$

2. $\begin{array}{r} 9503 \\ -5797 \\ \hline \end{array}$

3. $\begin{array}{r} \$8.25 \\ \times 45 \\ \hline \end{array}$

4. $6\overline{)5645}$

5. $\begin{array}{r} 8\frac{1}{8} \\ +9\frac{1}{8} \\ \hline \end{array}$

6. $\frac{1}{2}$ of 40 =

7. $\begin{array}{r} \frac{4}{5} \\ -\frac{2}{5} \\ \hline \end{array}$

8. $6\overline{)45}$

9. $\begin{array}{r} 6\frac{7}{8} \\ -4 \\ \hline \end{array}$

10. $\begin{array}{r} \frac{3}{8} \\ +5\frac{3}{8} \\ \hline \end{array}$

USING THE VOCABULARY OF ARITHMETIC

The opposite of the word **big** is **little**. Give the opposite of each of the words below:

add	deep	round	multiply	correct
broad	subtract	numerator	high	reduce
expensive	thin	divide	lose	sum
buy	farther	narrow	large	many

HOW WELL DO YOU REMEMBER?

1. How can you multiply a number by 10 quickly?
2. How much are 7 tens? 12 tens? 25 tens?
3. What do we call the 3 in the fraction, $\frac{3}{8}$? What do we call the 8? What do we call both the 3 and the 8?
4. Write two fractions that have the same value as $\frac{1}{2}$.
5. How do we reduce the fraction $\frac{4}{8}$ to lowest terms?
6. How can you tell when a fraction is reduced to lowest terms? Is $\frac{5}{6}$ reduced to lowest terms?
7. Write a mixed number on your paper in which the fraction is reduced to lowest terms.
8. Write a mixed number on your paper in which the fraction is not reduced to lowest terms. Then express the mixed number in simplest form.
9. Express the example, three divided by five, in at least three different ways.
10. How do you find the average weight of a number of chickens?
11. When do we write 0 in the quotient of a division example?
12. Explain each step in working this example: $7\frac{3}{8} + 4\frac{1}{8} = ?$
13. Draw a line 3 inches long. Below it draw a line $\frac{1}{3}$ as long. How can you tell it is $\frac{1}{3}$ as long?
14. Draw a square. In this square show 6 marbles divided into groups, each showing $\frac{1}{2}$ of the whole number.
15. Draw a circle. Color $\frac{3}{4}$ of the circle. What part of the circle is not colored?
16. Write sentences in which the following words are used:

sum	average	size	value	minus
compare	graph	terms	circle	temperature
inch	score	fraction	length	mixed number

MEASURING GROWTH IN PROBLEM SOLVING

1. James has saved $12.97. How much more must he save before he can buy a bicycle for $21.00?

2. Kate bought 5 yards of lace for $2.40. How much was the lace a yard?

3. How much do 10 dozen oranges cost if the oranges cost 36 cents a dozen?

4. Tom weighed 6 bananas. They weighed 24 ounces. Find their average weight.

5. Mary bought 2 dozen eggs at 28 cents a dozen and a roast of meat that cost $1.67. How much did she spend for the eggs and meat?

6. How much does $\frac{1}{4}$ yard of ribbon cost at 28 cents a yard?

7. A fast railroad train made a trip of 406 miles in 7 hours. How many miles did the train go on the average in an hour?

8. John is making a bird house. He has two 8-inch boards, one $3\frac{1}{4}$ feet long, the other $2\frac{1}{4}$ feet long. How long are the two boards?

9. It takes 48 tons of coal to heat the Baldwin School each year. How much does it cost to heat the school if the coal costs $4.78 a ton?

10. Margaret bought 3 loaves of bread at 14 cents a loaf. How much change should she receive if she gave the clerk two quarters?

What Your Score Means

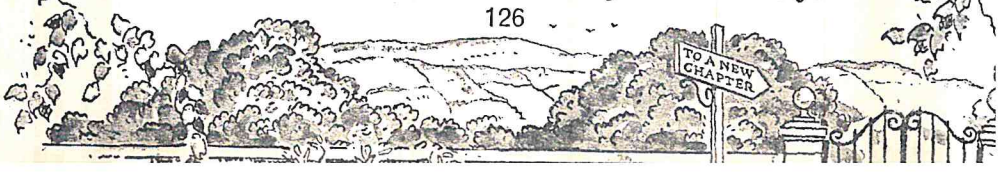
Unsatisfactory	Fair	Good	Excellent
0 1 2 3 4	5 6	7 8	9 10

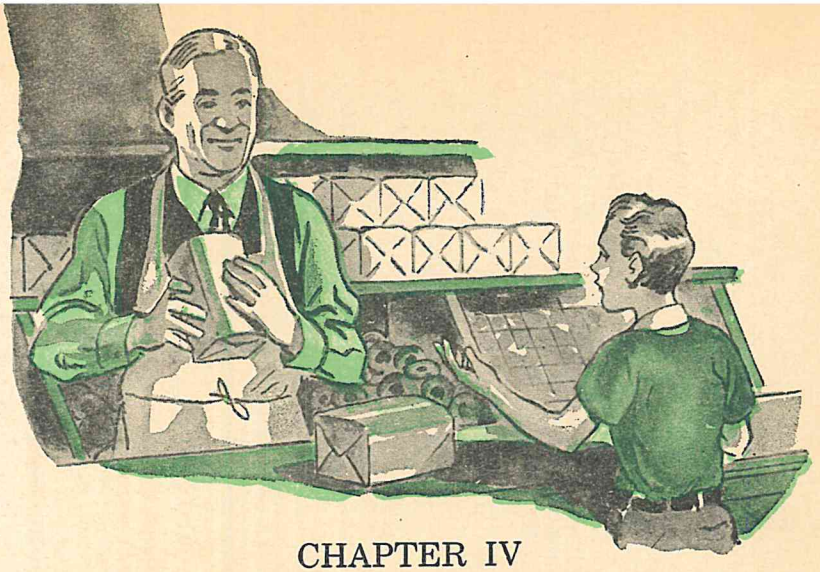
OPENING THE GATE TO THE NEW CHAPTER

This test will help you to find out how well you can work the different kinds of examples that you have studied.

1. Write in words: 7,820,406. (24)
2. Write in figures: six hundred ten thousand. (24)
3. Add: \$47.25, \$8.76, \$.29, and \$7.87. (14)
4. Subtract 4763 from 11202. (17)
5. Multiply 408 by 6. (25)
6. Divide 785 by 9. Check your answer. (33)
7. $\frac{4603}{5} = ?$ (33)
8. How much is 10×47? (48)
9. Multiply 78 by 50. (49)
10. Multiply: $69 \times 384 = ?$ (69)
11. How much is $12 \div 8$? (104)
12. Reduce to lowest terms: $\frac{8}{16}$, $\frac{6}{8}$. (94)
13. Divide: $8\overline{)4}$ or $4 \div 8 = ?$ (100)
14. Add: $\frac{3}{8} + \frac{1}{8} = ?$ (91)
15. Find the sum of $4\frac{1}{4} + 8\frac{1}{4} + 6\frac{1}{4}$. (102)
16. Write the fraction $\frac{4}{5}$ as a division example. (100)
17. How much is $\frac{5}{8} - \frac{3}{8}$? (113)
18. Subtract $2\frac{1}{4}$ from $6\frac{3}{4}$. (114)
19. Subtract $5\frac{1}{8}$ from $11\frac{1}{8}$. (116)
20. Subtract 34 from $34\frac{1}{2}$. (117)

After your paper has been marked, study and do again the examples you worked incorrectly. Turn for help to the pages given at the right. Do not be satisfied until you can work every example in this test easily and correctly.





CHAPTER IV

BUYING BREAD AT THE BAKERY

1. Jack bought 2 loaves of bread at 10 cents each. How much change should he receive from 25 cents?

2. How many 10-cent loaves of bread can he buy for 30 cents? Count by tens to find out.

3. Suppose that Jack buys six 10-cent loaves of bread and gives the clerk 60 cents. How much change should he receive?

4. Bread in 1-pound loaves costs 10 cents. In $1\frac{1}{2}$-pound loaves the bread costs 13 cents. How much does the extra $\frac{1}{2}$ pound of bread cost?

5. Jack's family uses two 10-cent loaves of bread each day. How much does the bread they need for a week cost?

6. Jack weighed a pound loaf of bread on the scales at home. The loaf weighed $16\frac{3}{4}$ ounces. How much more than a pound did the bread weigh?

*7. What are the local prices of bread in loaves of different sizes?

READINESS TEST FOR DIVISION BY TWO-FIGURE DIVISORS

I. Dividing by one-figure divisors.

	a	*b*	*c*	*d*	*e*
1.	$5\overline{)755}$	$8\overline{)1960}$	$4\overline{)280}$	$7\overline{)3542}$	$9\overline{)8640}$
2.	$6\overline{)305}$	$4\overline{)175}$	$3\overline{)2882}$	$5\overline{)3745}$	$8\overline{)7200}$

II. How well can you subtract?
Find the remainders:

	a	*b*	*c*	*d*	*e*
1.	79 − 72	95 − 88	117 − 96	608 − 531	847 − 828
2.	800 − 765	792 − 792	902 − 855	873 − 873	749 − 747

III. In which of these examples are the quotients correct? How can you tell?

1.	$4\overline{)38}$ 9, 36, 2	2. $5\overline{)43}$ 9, 45	3. $6\overline{)49}$ 7, 42, 7	4. $8\overline{)71}$ 8, 64, 7	5. $9\overline{)79}$ 9, 81

6. Which ones are not correct?

IV. Write the products only. Do not write out the work.

	a	*b*	*c*	*d*
1.	$3 \times 20 =$	$5 \times 35 =$	$9 \times 53 =$	$6 \times 66 =$
2.	$4 \times 41 =$	$6 \times 10 =$	$8 \times 74 =$	$7 \times 96 =$

V. Write only the part that is more. Which is more?

1. 4×20, or 84
2. 5×31, or 165
3. 3×52, or 148
4. 6×23, or 121
5. 7×43, or 325
6. 2×49, or 94
7. 4×56, or 214
8. 8×64, or 485
9. 9×71, or 680

PRACTICING SUBTRACTION USED IN DIVISION

Be sure you can work every subtraction example below before you begin the next work in division, which follows.

Set I

	a	*b*	*c*	*d*	*e*	*f*
1.	63	59	86	80	86	80
	−32	−54	−86	−70	−50	−80
2.	53	62	80	90	71	70
	−34	−54	−67	−87	−68	−62
3.	157	126	130	156	160	115
	−96	−96	−80	−90	−90	−95
4.	104	106	100	104	100	100
	−91	−86	−70	−80	−86	−96
5.	136	114	110	100	104	112
	−98	−86	−87	−95	−86	−78

Set II

	a	*b*	*c*	*d*	*e*	*f*
1.	167	397	475	554	361	332
	−152	−360	−455	−504	−328	−306
2.	560	450	501	300	989	803
	−522	−408	−448	−297	−891	−792
3.	304	654	453	204	642	420
	−284	−594	−390	−170	−588	−384
4.	412	210	196	400	612	310
	−364	−164	−196	−400	−600	−301

DIVIDING BY TEN

1. Soap costs 10 cents a bar. How many bars can you buy for 50 cents?

$$10\overline{)50}\quad 5$$

$$\underline{50}$$

Check:

$5 \times 10 = 50$

THINK: 50 ÷ 10 = 5 tens ÷ 1 ten = 50 ones ÷ 10 ones = ?

There are five 10's in 50. Write the 5 over the 0 in 50 because you are dividing 50 ones by 10 ones. You can see that there are as many 10's in 50 as there are 1's in 5. $1\overline{)5} = 5$.

You can buy 5 bars of soap.

Divide:

	a	*b*	*c*	*d*
2.	$10\overline{)20}$	$10\overline{)80}$	$10\overline{)10}$	$10\overline{)40}$
3.	$10\overline{)60}$	$10\overline{)70}$	$10\overline{)30}$	$10\overline{)90}$

4. How many bars of soap at 10 cents each can you buy for 57 cents? How many cents will be left?

$$10\overline{)57}\quad 5$$

$$\underline{50}$$

$$7$$

Check:

$5 \times 10 = 50$

$50 + 7 = 57$

THINK: 57 ÷ 10 = ?

You can see that there are as many 10's in 57 as there are 1's in 5. $1\overline{)5} = 5$.

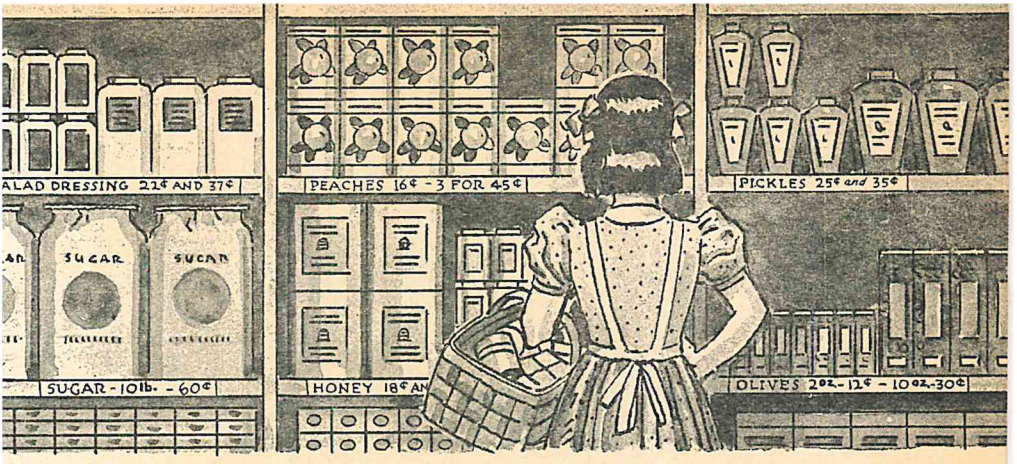
Five bars cost $5 \times 10¢$, or $50¢$.

Subtract 50 from 57. There will be $7¢$ left.

You can buy 5 bars and will have 7 cents left.

Divide and check:

	a	*b*	*c*	*d*	*e*
5.	$10\overline{)11}$	$10\overline{)23}$	$10\overline{)46}$	$10\overline{)33}$	$10\overline{)54}$
6.	$10\overline{)65}$	$10\overline{)78}$	$10\overline{)96}$	$10\overline{)27}$	$10\overline{)83}$
7.	$10\overline{)39}$	$10\overline{)57}$	$10\overline{)87}$	$10\overline{)18}$	$10\overline{)84}$



SAVING MONEY IN BUYING GROCERIES

1. A pint jar of sweet pickles costs 25 cents. A quart jar costs 35 cents. How much do two pint jars of pickles cost? How much cheaper would it be to buy a quart jar?

2. A quart jar of salad dressing costs 37 cents. A pint jar costs 22 cents. How much is saved by buying a quart jar instead of two pint jars?

3. Sugar costs 8 cents a pound when bought by the pound. When bought in 10-pound sacks, the cost is 60 cents for the sack. How much a pound is the price of the sugar in 10-pound sacks? How much less a pound is this price than when sugar is bought by the pound?

4. Cans of peaches cost 16 cents each. When bought three at a time, the three cans cost 45 cents. How much is saved by buying three cans at one time instead of three cans one can at a time?

5. A pound jar of honey costs 18 cents. A 5-pound pail costs 55 cents. How much less a pound is the honey in the 5-pound pail than the honey in the 1-pound jar?

6. A 2-ounce bottle of olives costs 12 cents. A 10-ounce bottle costs 30 cents. How much an ounce is the cost of the olives in the 2-ounce bottle? in the 10-ounce bottle?

DIVIDING BY TWO-FIGURE NUMBERS

1. If one movie ticket costs 20 cents, how many tickets can you buy for 80 cents?

THINK: 80 ÷ 20 = ? 80 ones ÷ 20 ones = ?

There are as many 20's in 80 as there are 2's in 8. $2\overline{)8} = 4$. So there are four 20's in 80.

Write 4 in ones' place over the 0 in 80, because we are dividing 80 ones by 20 ones.

Multiply 20 by 4. Write 80 under the 80.

You can buy four 20-cent tickets.

$$\begin{array}{r} 4 \\ 20\overline{)80} \\ \underline{80} \\ \end{array}$$

Divide, and check your answers by multiplying.

	a	*b*	*c*	*d*	*e*	*f*
2.	$20\overline{)40}$	$30\overline{)60}$	$20\overline{)60}$	$30\overline{)90}$	$40\overline{)80}$	$20\overline{)80}$

3. Jack has 78 cents. How many 20-cent movie tickets can he buy? How many cents will he have left?

THINK: 78¢ ÷ 20 = ?

There are about as many 20's in 78 as there are 2's in 7. $2\overline{)7} = 3$ and a remainder.

So there are three 20's in 78, and a remainder.

Write 3 above the 8 in 78. Why?

Multiply 20 by 3. Write 60 under 78.

Compare 60 and 78. Can you subtract these numbers?

Subtract: 78 − 60 = 18. Is the remainder, 18, less than the divisor, 20?

Explain the check.

Jack can buy 3 tickets and have 18 cents left.

$$\begin{array}{r} 3 \\ 20\overline{)78} \\ 60 \\ \hline 18 \end{array}$$

Check:

$$\begin{array}{r} 20 \\ \times 3 \\ \hline 60 \\ +18 \\ \hline 78 \end{array}$$

Divide and check your work:

	a	*b*	*c*	*d*	*e*	*f*
4.	$20\overline{)47}$	$50\overline{)53}$	$40\overline{)85}$	$70\overline{)71}$	$60\overline{)67}$	$80\overline{)89}$
5.	$20\overline{)53}$	$40\overline{)59}$	$30\overline{)47}$	$50\overline{)63}$	$20\overline{)35}$	$30\overline{)57}$
6.	$30\overline{)84}$	$20\overline{)73}$	$50\overline{)84}$	$60\overline{)89}$	$40\overline{)75}$	$70\overline{)93}$

HOW WELL CAN YOU USE YOUR ARITHMETIC?

A good test of how well you understand and use arithmetic is to prepare word-problems about arithmetic examples. See if you can make a good problem about each example given below. Let your class decide who makes the most interesting problems.

1. $\begin{array}{r} \$.75 \\ .50 \\ .80 \\ \hline \end{array}$

2. $\begin{array}{r} \$5.25 \\ -1.75 \\ \hline \end{array}$

3. $\begin{array}{r} 12 \\ \times 30 \\ \hline \end{array}$

4. $7\overline{)28}$

5. $4\overline{)18 \text{ in.}}$

6. 8 gal. = ? qt.

7. 30 min. − 12 min. =

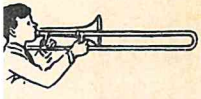
8. $\begin{array}{r} 400 \text{ mi.} \\ -375 \text{ mi.} \\ \hline \end{array}$

9. $\begin{array}{r} \$.38 \\ \times 6 \\ \hline \end{array}$

10. $8\overline{)\$.96}$

11. $\begin{array}{r} 87 \text{ lb.} \\ -68 \text{ lb.} \\ \hline \end{array}$

*12. Bring to class a problem showing how you used arithmetic in something you did in life outside the school.

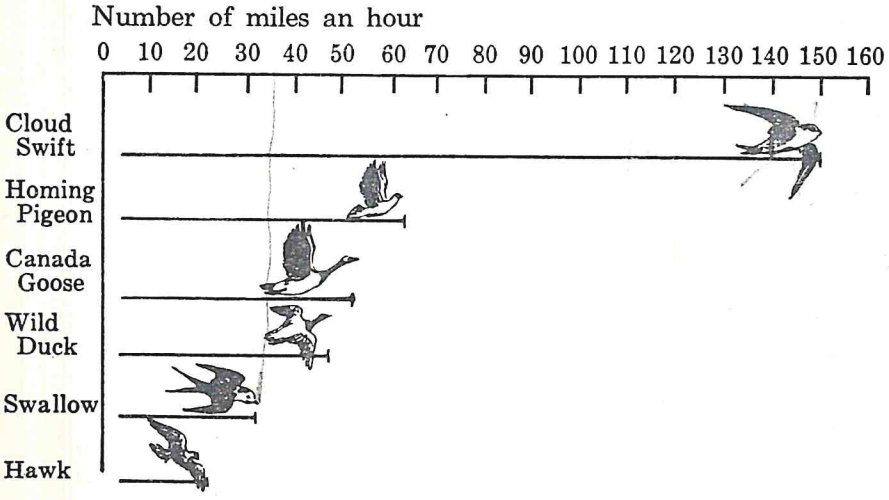


LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$\begin{array}{r} 37 \\ \times 20 \\ \hline \end{array}$	$6\overline{)965}$	$\begin{array}{r} 48 \\ \times 27 \\ \hline \end{array}$	$20\overline{)84}$	$\begin{array}{r} 12\frac{5}{8} \\ -7\frac{1}{8} \\ \hline \end{array}$
2.	$30\overline{)79}$	$\frac{1}{2}$ of 112 =	$\begin{array}{r} 4\frac{1}{4} \\ +2\frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} 3080 \\ -1090 \\ \hline \end{array}$	$50\overline{)83}$
3.	$\begin{array}{r} 25\frac{1}{2} \\ +4 \\ \hline \end{array}$	$\begin{array}{r} \$3.75 \\ \times 40 \\ \hline \end{array}$	$\begin{array}{r} 6\frac{1}{2} \\ -4\frac{1}{2} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{3}{8} \\ +6\frac{3}{8} \\ \hline \end{array}$	$10\overline{)90}$

4. \$97.48 + \$.09 + \$1.75 + \$.67 =

HOW FAST DO BIRDS FLY?


Number of miles an hour
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
Cloud Swift
Homing Pigeon
Canada Goose
Wild Duck
Swallow
Hawk

The chart above tells you about how many miles an hour six different kinds of birds fly.

1. The numbers across the top of the graph tell the number of miles an hour. You can see that the line after cloud swift reaches as far as the 150-mile-an-hour mark. This shows that cloud swifts fly 150 miles an hour. How fast do the other birds fly?

2. Which bird is the slowest? How far does it fly an hour?

3. Which bird flies about a mile a minute? Do you know what this bird is used for?

4. How far can Canada geese fly in 10 hours?

5. You can see that the wild duck flies between 40 and 50 miles an hour, or about 45 miles an hour. About how far does the swallow fly an hour?

6. The falcon, a bird used in hunting other birds, dives toward the bird it is hunting at the rate of 180 miles an hour. How many miles is this a minute?

DIVIDING THREE-PLACE NUMBERS

1. Jack has 120 marbles. He wishes to divide them equally among 30 boys. How many should he give each boy?

$$\begin{array}{r} 4 \\ 30\overline{)120} \\ \underline{120} \end{array}$$

There are as many 30's in 120 as there are 3's in 12. $3\overline{)12}$ is 4.

We are dividing 120 ones by 30 ones. So we write 4 above the 0 in 120, which is ones' place.

Jack can give each boy 4 marbles.

Divide:

	a	*b*	*c*	*d*	*e*
2.	$20\overline{)120}$	$40\overline{)160}$	$30\overline{)150}$	$50\overline{)250}$	$60\overline{)420}$
3.	$90\overline{)546}$	$70\overline{)218}$	$60\overline{)305}$	$80\overline{)487}$	$70\overline{)493}$

4. Arthur wishes to divide 175 marbles equally among 20 boys. How many can he give each boy? How many will he have left?

$$\begin{array}{r} 8 \\ 20\overline{)175} \\ \underline{160} \\ 15 \end{array}$$

Check:

$$\begin{array}{r} 20 \\ \times 8 \\ \hline 160 \\ +15 \\ \hline 175 \end{array}$$

The Steps in Division

1. Are there any 20's in 17? in 175? There are as many 20's in 175 as there are 2's in 17. Think: $2\overline{)17} = 8$ and a remainder. So there are eight 20's in 175 and a remainder. Write 8 above the 5 in 175. Why?
2. Multiply 20 by 8. This gives 160.
3. Can you subtract 160 from 175?
4. Subtract 160 from 175. This gives 15.
5. Is the remainder less than the divisor?

Arthur can give each boy 8 marbles and he will have 15 marbles left.

	a	*b*	*c*	*d*	*e*
5.	$20\overline{)135}$	$30\overline{)163}$	$50\overline{)327}$	$40\overline{)137}$	$70\overline{)240}$
6.	$80\overline{)352}$	$90\overline{)290}$	$20\overline{)191}$	$60\overline{)273}$	$40\overline{)347}$
7.	$70\overline{)652}$	$40\overline{)251}$	$70\overline{)185}$	$30\overline{)237}$	$80\overline{)700}$

A QUICK REVIEW OF FRACTIONS

Set I Reducing to Lowest Terms

Reduce each of these numbers to its simplest form.

1. $\frac{2}{4}$, $\frac{4}{8}$, $\frac{2}{8}$ 2. $8\frac{2}{8}$, $7\frac{2}{4}$, $9\frac{6}{8}$ 3. $6\frac{10}{16}$, $9\frac{10}{12}$, $8\frac{6}{12}$

Set II Addition

Find the sums. Reduce all fractions in the answers.

	a	*b*	*c*	*d*	*e*
1.	$\frac{1}{4}$ $\frac{1}{4}$	$3\frac{3}{8}$ $2\frac{1}{8}$	$4\frac{1}{3}$ $2\frac{2}{3}$	$\frac{1}{4}$ $\frac{2}{4}$	$3\frac{5}{8}$ $2\frac{1}{8}$
2.	$6\frac{1}{6}$ $2\frac{1}{6}$	$\frac{1}{8}$ $\frac{1}{8}$	7 $9\frac{1}{2}$	$3\frac{1}{8}$ $6\frac{5}{8}$	$2\frac{1}{2}$ 5
3.	9 $4\frac{5}{6}$	$8\frac{5}{12}$ $9\frac{5}{12}$	$\frac{3}{8}$ $\frac{1}{8}$	$8\frac{5}{16}$ $7\frac{3}{16}$	$\frac{1}{6}$ $\frac{4}{6}$
4.	$6\frac{1}{4}$ 5 $9\frac{1}{4}$	$\frac{3}{8}$ $\frac{3}{8}$ $\frac{1}{8}$	$4\frac{1}{2}$ 3 9	6 $7\frac{1}{4}$ 5	$9\frac{1}{4}$ $6\frac{1}{4}$ $7\frac{1}{4}$

Set III Subtraction

Find the remainders.

	a	*b*	*c*	*d*	*e*
1.	$\frac{3}{4}$ $\frac{1}{4}$	$6\frac{2}{3}$ $4\frac{1}{3}$	$\frac{5}{6}$ $\frac{1}{6}$	$7\frac{1}{2}$ $\frac{1}{2}$	$\frac{5}{8}$ $\frac{1}{8}$
2.	$\frac{1}{2}$ $\frac{1}{2}$	$\frac{7}{8}$ $\frac{3}{8}$	$6\frac{3}{4}$ $5\frac{1}{4}$	$\frac{7}{8}$ $\frac{5}{8}$	$8\frac{3}{8}$ 5
3.	$9\frac{3}{4}$ $\frac{1}{4}$	$4\frac{2}{3}$ $\frac{2}{3}$	$\frac{5}{8}$ $\frac{3}{8}$	$7\frac{5}{6}$ $2\frac{1}{6}$	$7\frac{11}{12}$ $5\frac{5}{12}$
4.	$5\frac{1}{2}$ 4	$9\frac{3}{8}$ $9\frac{1}{8}$	$2\frac{1}{2}$ $2\frac{1}{2}$	$7\frac{2}{3}$ $\frac{1}{3}$	$6\frac{7}{8}$ $5\frac{1}{8}$

DIVIDING BY A TWO-PLACE NUMBER

1. At a picnic there were 84 sandwiches for 21 children. How many sandwiches were there for each child?

$$\begin{array}{r} 4 \\ 21\overline{)84} \\ \underline{84} \end{array}$$

There are about as many 21's in 84 as there are 2's in 8. Think: $2\overline{)8} = 4$.

Since there are four 2's in 8, there are probably four 21's in 84.

Since we are dividing 84 ones by 21 ones, we write 4 in the quotient above the 4 in 84, which is in ones' place.

Check:

$$\begin{array}{r} 21 \\ \times 4 \\ \hline 84 \end{array}$$

Multiply 21 by 4. This gives 84.

Since $84 - 84 = 0$, there is no remainder.

Each child can have 4 sandwiches.

Divide and check your work:

	a	*b*	*c*	*d*	*e*	*f*
2.	$11\overline{)22}$	$21\overline{)63}$	$42\overline{)84}$	$12\overline{)48}$	$31\overline{)93}$	$14\overline{)28}$
3.	$24\overline{)48}$	$36\overline{)36}$	$31\overline{)62}$	$21\overline{)42}$	$44\overline{)88}$	$23\overline{)69}$
4.	$33\overline{)99}$	$22\overline{)88}$	$21\overline{)84}$	$42\overline{)84}$	$32\overline{)64}$	$41\overline{)82}$

5. At a party there were 42 children. There were 168 sandwiches in all. How many were there for each child?

$$\begin{array}{r} 4 \\ 42\overline{)168} \\ \underline{168} \end{array}$$

There are about as many 42's in 168 as there are 4's in 16. $4\overline{)16} = 4$.

Then there are probably four 42's in 168.

Write 4 in the quotient above the 8 in 168. Why?

Multiply 42 by 4. This gives 168.

Each child can have 4 sandwiches.

Divide and check your work:

	a	*b*	*c*	*d*	*e*
6.	$21\overline{)147}$	$61\overline{)122}$	$53\overline{)106}$	$91\overline{)182}$	$72\overline{)288}$
7.	$43\overline{)129}$	$52\overline{)156}$	$71\overline{)142}$	$62\overline{)186}$	$42\overline{)168}$
8.	$54\overline{)108}$	$52\overline{)128}$	$92\overline{)276}$	$83\overline{)249}$	$41\overline{)205}$

MARTHA HAS A BIRTHDAY PARTY

1. Martha's mother bought 40 apples for the party. There were to be 20 children at the party. How many apples did Martha's mother buy for each child?

2. She also bought 5 dozen cookies for the party. How many cookies was that in all? How many cookies were there for each child?

3. Half of the children at the party were boys. How many girls were there?

4. The children ate $1\frac{1}{4}$ pounds of fudge candy and $2\frac{1}{4}$ pounds of cream candy. How many pounds of candy did they eat in all?

5. The party began at 3:00 and was over at 5:30. How long did the party last?

*6. Suppose that Martha's birthday is today and that she is 11 years old. In what year was she born?

PRACTICE IN MULTIPLICATION

If you can multiply well, division will be easier for you. Write the products only. Do not write out the work.

	a	*b*	*c*	*d*	*e*
1.	$20 \times 3 =$	$30 \times 2 =$	$20 \times 4 =$	$60 \times 1 =$	$30 \times 3 =$
2.	$22 \times 3 =$	$21 \times 4 =$	$24 \times 2 =$	$32 \times 2 =$	$32 \times 3 =$
3.	$30 \times 4 =$	$60 \times 5 =$	$21 \times 6 =$	$32 \times 4 =$	$41 \times 7 =$
4.	$63 \times 2 =$	$51 \times 5 =$	$53 \times 3 =$	$51 \times 6 =$	$54 \times 2 =$
5.	$60 \times 8 =$	$41 \times 9 =$	$91 \times 5 =$	$71 \times 8 =$	$82 \times 4 =$

WORKING WITH REMAINDERS IN DIVISION

1. One morning Mary baked 38 cookies. How many cookie boxes containing 12 cookies each can she fill? How many cookies will there be left?

$$\begin{array}{r} 3\text{ r}2 \\ 12\overline{)38} \\ \underline{36} \\ 2 \end{array}$$

Check:

$$\begin{array}{r} 12 \\ \times 3 \\ \hline 36 \\ +2 \\ \hline 38 \end{array}$$

THINK: $38 \div 12 = ?$

Find the quotient figure as before. In this example there is a remainder. Compare the remainder, 2, with the divisor, 12. 2 is less than 12. Write the remainder as shown in the quotient of the example.

Mary can fill 3 boxes. There will be 2 cookies left.

The remainder should always be less than the number by which you are dividing.

In most of the examples below there will be a remainder. Write the remainder as shown in the example at the top of the page. Check your work. Be sure to place your quotient correctly.

	a	*b*	*c*	*d*	*e*
2.	$12\overline{)25}$	$11\overline{)59}$	$21\overline{)87}$	$23\overline{)48}$	$41\overline{)47}$
3.	$41\overline{)249}$	$71\overline{)213}$	$81\overline{)85}$	$34\overline{)68}$	$52\overline{)209}$
4.	$33\overline{)68}$	$13\overline{)28}$	$31\overline{)97}$	$20\overline{)78}$	$10\overline{)57}$
5.	$44\overline{)89}$	$92\overline{)369}$	$82\overline{)248}$	$61\overline{)368}$	$72\overline{)218}$
6.	$53\overline{)159}$	$22\overline{)69}$	$73\overline{)146}$	$51\overline{)308}$	$93\overline{)279}$
7.	$32\overline{)99}$	$64\overline{)129}$	$12\overline{)39}$	$40\overline{)167}$	$72\overline{)289}$

8. At the rate of 42 miles an hour, how long would it take a train to go 168 miles?

9. How many ribbons 20 inches long can be cut from a ribbon 77 inches long? How many inches will be left?

10. How many 20-cent tickets can you buy for 55 cents? How many cents will be left?

CAMPING AT THE LAKE

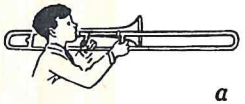
1. It is 160 miles from Margaret's house to the lake. How long does it take to drive to the lake if they go at the rate of 40 miles an hour?

2. The lake is $1\frac{1}{4}$ miles wide. How far does Margaret go if she rows across the lake and back again?

3. The lake is $2\frac{3}{4}$ miles long. How much longer is the lake than it is wide?

4. To go to the lake they need 10 gallons of gasoline. How much does the gasoline cost at 23 cents a gallon?

5. When Margaret went to the lake last summer she weighed $87\frac{1}{4}$ pounds. At the end of the summer she weighed $90\frac{3}{4}$ pounds. How much did she gain in weight during the summer?



LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	43×10	$3\frac{1}{4} + 8\frac{1}{4}$	$5\overline{)185}$	$7095 - 2687$	$10\overline{)70}$
2.	$\frac{3}{8} + \frac{3}{8}$	$6\overline{)487}$	$20\overline{)180}$	57×36	$7\frac{3}{8} - 4\frac{1}{8}$
3.	$30\overline{)98}$	$\$8.75 \times 58$	$6\frac{2}{3} - 1\frac{2}{3}$	$73\overline{)149}$	$42\overline{)168}$

4. $9684 + 875 + 9 + 1958 =$

WATCHING SUBTRACTION IN DIVISION

1. At 22 cents each how many airplane models can a boy buy for 70 cents? How many cents will he have left?

```
  3r4
22)70
  66
  4
```

To find the number of 22's in 70, think: $2\overline{)7} = 3$. There are three 2's in 7. Then there are probably three 22's in 70.

Write 3 above the 0 in 70. Why?

Multiply 22 by 3. This gives 66.

Can you subtract 66 from 70?

Subtract 66 from 70. There is a remainder of 4. Is the remainder less than 22?

He can buy 3 models and will have 4¢ left.

Divide and check your work. Watch the subtraction.

	a	*b*	*c*	*d*	*e*	*f*
2.	$21\overline{)70}$	$31\overline{)80}$	$33\overline{)40}$	$41\overline{)90}$	$22\overline{)73}$	$32\overline{)73}$
3.	$53\overline{)81}$	$42\overline{)51}$	$24\overline{)53}$	$34\overline{)86}$	$25\overline{)34}$	$67\overline{)82}$
4.	$21\overline{)90}$	$34\overline{)81}$	$42\overline{)93}$	$23\overline{)71}$	$42\overline{)90}$	$33\overline{)81}$

5. If there are 21 apples in a box, how many boxes can you fill if you have 130 apples?

```
  6r4
21)130
 126
   4
```

How do we find the 6 in the quotient?

Show that the work at the left is correct.

Divide. Check the first row of examples:

	a	*b*	*c*	*d*	*e*
6.	$41\overline{)170}$	$61\overline{)130}$	$21\overline{)132}$	$31\overline{)162}$	$51\overline{)263}$
7.	$71\overline{)303}$	$32\overline{)143}$	$42\overline{)183}$	$52\overline{)181}$	$63\overline{)200}$
8.	$83\overline{)271}$	$88\overline{)153}$	$92\overline{)401}$	$74\overline{)191}$	$97\overline{)136}$

DIVISION WITH CARRYING IN MULTIPLICATION

1. Mary's mother baked 78 cookies for a cookie sale. If she puts 24 cookies in each box, how many boxes can she fill?

$$\begin{array}{r} 3 \text{ r}6 \\ 24\overline{)78} \\ 72 \\ \hline 6 \end{array}$$

How do we find the 3 in the quotient?
Multiply 24 by 3. Here you must carry in multiplying. Do your work carefully.
Show how to get the 72.
There will be 3 full boxes and 6 cookies left.

Write the products only. Do not write out the work.

	a	*b*	*c*	*d*	*e*
2.	$35 \times 2 =$	$44 \times 4 =$	$46 \times 5 =$	$48 \times 2 =$	$34 \times 3 =$
3.	$64 \times 3 =$	$36 \times 4 =$	$98 \times 3 =$	$54 \times 4 =$	$75 \times 2 =$
4.	$25 \times 3 =$	$95 \times 4 =$	$65 \times 3 =$	$88 \times 3 =$	$74 \times 4 =$
5.	$38 \times 2 =$	$26 \times 2 =$	$45 \times 5 =$	$37 \times 3 =$	$86 \times 4 =$
6.	$77 \times 4 =$	$89 \times 3 =$	$76 \times 2 =$	$33 \times 4 =$	$67 \times 5 =$

Divide and check your work:

	a	*b*	*c*	*d*	*e*
7.	$35\overline{)76}$	$54\overline{)219}$	$44\overline{)178}$	$34\overline{)105}$	$25\overline{)78}$
8.	$65\overline{)195}$	$74\overline{)296}$	$95\overline{)382}$	$36\overline{)144}$	$48\overline{)99}$
9.	$64\overline{)195}$	$75\overline{)155}$	$88\overline{)264}$	$98\overline{)294}$	$46\overline{)233}$
10.	$26\overline{)58}$	$37\overline{)111}$	$86\overline{)345}$	$38\overline{)78}$	$45\overline{)227}$
11.	$33\overline{)136}$	$77\overline{)309}$	$67\overline{)339}$	$89\overline{)268}$	$87\overline{)439}$
12.	$93\overline{)375}$	$27\overline{)59}$	$78\overline{)390}$	$34\overline{)138}$	$56\overline{)280}$

MIXED PRACTICE IN DIVISION

1.	$10\overline{)76}$	$20\overline{)40}$	$30\overline{)180}$	$67\overline{)85}$	$40\overline{)286}$
2.	$24\overline{)77}$	$30\overline{)84}$	$41\overline{)137}$	$32\overline{)289}$	$56\overline{)179}$
3.	$32\overline{)67}$	$76\overline{)318}$	$21\overline{)179}$	$88\overline{)267}$	$93\overline{)283}$

EVERYDAY USES OF ARITHMETIC

1. At 32 cents a pound how many pounds of butter can you buy for 96 cents?

2. There were 21 automobiles to take the children to the picnic. In all there were 105 children. How many children were there for each automobile?

3. If a train goes at the rate of 54 miles an hour, how long will it take the train to go 432 miles?

4. If an airplane goes 156 miles in one hour, how far can it go in 12 hours?

5. A grocer paid $48.00 for 24 barrels of apples. How much did he pay for one barrel?

6. How many hours are there in 300 minutes?

7. At a party there were 135 sandwiches for 45 children. How many sandwiches were there for each child?

8. Mrs. Smith had $9\frac{3}{4}$ yards of cloth. She cut off a piece $5\frac{1}{4}$ yards long. How long was the piece that was left?

9. Jane rode $3\frac{1}{4}$ miles on her bicycle in the morning and $2\frac{1}{4}$ miles in the afternoon. How far did she ride in all?

PRACTICE IN NAMING QUOTIENTS

Set I

	a	*b*	*c*	*d*	*e*
1.	$26\overline{)57}$	$36\overline{)109}$	$46\overline{)195}$	$56\overline{)346}$	$62\overline{)378}$
2.	$66\overline{)468}$	$20\overline{)79}$	$76\overline{)398}$	$86\overline{)778}$	$96\overline{)789}$
3.	$40\overline{)397}$	$16\overline{)19}$	$25\overline{)53}$	$35\overline{)140}$	$75\overline{)610}$

Set II

1.	$45\overline{)236}$	$85\overline{)524}$	$50\overline{)283}$	$55\overline{)175}$	$95\overline{)784}$
2.	$90\overline{)873}$	$65\overline{)348}$	$27\overline{)59}$	$47\overline{)148}$	$57\overline{)342}$
3.	$75\overline{)178}$	$97\overline{)699}$	$67\overline{)278}$	$71\overline{)499}$	$87\overline{)783}$

GATHERING EGGS

Paul is helping his father to gather the eggs in the hen house.

1. Today he gathered 48 eggs. How many dozen eggs was this?

2. Yesterday he gathered 5 dozen eggs. How many more eggs did he gather yesterday than today?

3. Paul weighed a dozen of the largest eggs and a dozen of the smallest eggs. The dozen largest eggs weighed $1\frac{3}{4}$ pounds and the dozen smallest eggs weighed $1\frac{1}{4}$ pounds. Find the difference in their weights.

4. One week Paul gathered 252 eggs. How many eggs was that on the average a day? How many dozen a day?

5. Paul received 72 cents for some eggs he sold to a neighbor. How many dozen eggs did Paul sell if he received 24 cents a dozen for the eggs?

*6. Where are eggs cheaper, in the country or in the city? Why?

LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$10\overline{)83}$	$4\frac{1}{3}$ $+2\frac{1}{3}$	84 $\times 10$	$65\overline{)81}$	$\frac{7}{8}$ $-\frac{5}{8}$
2.	$74\overline{)192}$	$6\frac{1}{2}$ $-2\frac{1}{2}$	$20\overline{)47}$	76 $\times 87$	$54\overline{)220}$
3.	7964 -5786	$42\overline{)307}$	\$3.98 $\times 69$	$6\frac{3}{8}$ $+9\frac{3}{8}$	$5\frac{3}{4}$ $-3\frac{1}{4}$

4. Find the sum of \$48.50, \$6.84, \$9.67, and \$172.69.

MORE DIFFICULT EXAMPLES IN DIVISION

1. If tea costs 36 cents a package, how many packages can you buy for 80 cents?

$$\begin{array}{r} 2 \\ 36\overline{)80} \\ \underline{72} \\ 8 \end{array}$$

THINK: $80¢ \div 36¢ = ?$
How do we find the quotient figure, 2?
Multiply 36 by 2. This gives 72.
Now subtract 72 from 80. How do we get the remainder, 8?
You can buy 2 packages and have $8¢$ left.

Subtract. Work on these examples will help you with the division examples below:

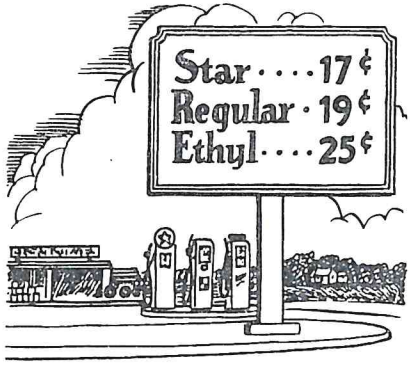
	a	*b*	*c*	*d*	*e*	*f*	*g*
2.	70	83	58	73	77	54	37
	48	68	50	54	69	39	27
3.	495	196	179	290	179	180	267
	488	159	158	248	159	144	258
4.	146	296	100	693	272	117	284
	89	279	88	639	256	108	248

Divide. Watch both the multiplication and the subtraction. Check your work on the first examples in each row:

	a	*b*	*c*	*d*	*e*
5.	$34\overline{)83}$	$39\overline{)54}$	$48\overline{)70}$	$54\overline{)73}$	$29\overline{)37}$
6.	$61\overline{)495}$	$53\overline{)196}$	$62\overline{)290}$	$72\overline{)180}$	$86\overline{)267}$
7.	$89\overline{)146}$	$71\overline{)693}$	$54\overline{)117}$	$62\overline{)284}$	$25\overline{)58}$
8.	$31\overline{)296}$	$23\overline{)77}$	$79\overline{)179}$	$53\overline{)179}$	$64\overline{)272}$
9.	$78\overline{)340}$	$75\overline{)129}$	$91\overline{)889}$	$82\overline{)340}$	$44\overline{)100}$

10. How many towels each 44 inches long can be cut from a piece of cloth 220 inches long?

11. If one notebook costs 25 cents, how many can you buy for 75 cents?



WHICH SHOULD I BUY?

1. At the gasoline station Don saw the sign at the left giving the prices of three grades of gasoline. How much did a gallon of each grade of gasoline cost?

2. How much less than a gallon of Ethyl gasoline did a gallon of regular gasoline cost?

3. How much more than a gallon of Star gasoline did a gallon of regular gasoline cost? a gallon of Ethyl gasoline?

4. Mr. Jones bought 12 gallons of gasoline at 25 cents a gallon. How much did he pay for the gasoline?

5. How much did Mr. Jones pay for 3 quarts of oil at 30 cents a quart?

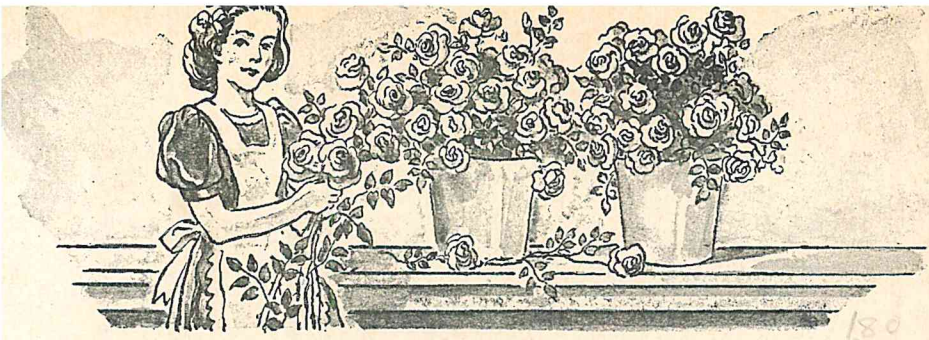
6. How much change should he receive from a ten-dollar bill?

*7. Find local prices of different grades of gasoline and find differences in prices. Are the prices of all kinds of gasoline the same? If not, why not?

WATCHING SUBTRACTION IN DIVISION

In these examples you must be very careful in the subtraction. Be sure to check your work.

	a	*b*	*c*	*d*	*e*
1.	$72\overline{)341}$	$83\overline{)817}$	$92\overline{)427}$	$93\overline{)341}$	$82\overline{)234}$
2.	$84\overline{)226}$	$63\overline{)238}$	$72\overline{)315}$	$94\overline{)235}$	$41\overline{)310}$
3.	$91\overline{)512}$	$93\overline{)357}$	$81\overline{)311}$	$63\overline{)228}$	$91\overline{)625}$



EARNING MONEY

1. Jim sold 24 newspapers. If he received in all 72 cents, how much did he receive for each newspaper?

2. Jack cut the grass on three lawns. He received 75 cents for the first lawn, 45 cents for the second lawn, and 60 cents for the third lawn. How much did he earn in all?

3. Joan picked 54 roses. She made bouquets of 6 roses in each bouquet. These she sold at 25 cents each. How much did she receive for the bouquets of roses?

*4. Make up two problems about earning money. How do boys and girls earn money?

PRACTICE IN DIVISION

In the examples below it will be necessary to carry in multiplication and to use harder subtraction with remainders.

	a	*b*	*c*	*d*	*e*
1.	$77\overline{)629}$	$24\overline{)57}$	$44\overline{)197}$	$74\overline{)518}$	$23\overline{)95}$
2.	$34\overline{)178}$	$94\overline{)382}$	$83\overline{)747}$	$73\overline{)268}$	$54\overline{)398}$
3.	$94\overline{)846}$	$68\overline{)350}$	$84\overline{)377}$	$24\overline{)78}$	$74\overline{)596}$
4.	$62\overline{)271}$	$58\overline{)249}$	$95\overline{)855}$	$83\overline{)747}$	$96\overline{)594}$
5.	$78\overline{)395}$	$28\overline{)59}$	$32\overline{)143}$	$68\overline{)476}$	$87\overline{)531}$
6.	$48\overline{)144}$	$53\overline{)498}$	$86\overline{)632}$	$97\overline{)779}$	$47\overline{)102}$

FUN WITH NUMBERS

In the examples below the signs are missing. Study the numbers in each example and then decide what the signs should be. Then write the example on your paper in correct form. If you can do all of the work in this exercise correctly, you are a very good thinker.

1. $27 \; (?) \; 49 = 76$
2. $847 \; (?) \; 256 = 591$
3. $378 \; (?) \; 9 = 42$
4. $3\frac{3}{4} \; (?) \; 1\frac{1}{4} = 2\frac{1}{2}$
5. $20 \; (?) \; 36 = 720$
6. $60 \; (?) \; 20 = 3$
7. $8 \; (?) \; 0 = 0$
8. $78 \; (?) \; 645 = 723$
9. $856 \; (?) \; 2 = 428$
10. $10 \; (?) \; 18 = 180$
11. $436 \; (?) \; 528 = 964$
12. $2\frac{1}{4} \; (?) \; 6\frac{1}{4} = 8\frac{1}{2}$
13. $908 \; (?) \; 760 = 148$
14. $244 \; (?) \; 61 = 4$
15. $8 \; (?) \; 72 = 576$
16. $90 \; (?) \; 10 = 9$
17. $4\frac{3}{8} \; (?) \; 7 = 11\frac{3}{8}$
18. $90 \; (?) \; 10 = 80$
19. $6 \; (?) \; 6 = 36$
20. $80 \; (?) \; 80 = 1$
21. $9\frac{1}{2} \; (?) \; 4 = 5\frac{1}{2}$
22. $\frac{3}{4} \; (?) \; \frac{1}{4} = \frac{1}{2}$
23. $7 \; (?) \; 7 = 49$
24. $35 \; (?) \; 135 = 170$
25. $360 \; (?) \; 90 = 4$
26. $9 \; (?) \; 87 = 783$
27. $\frac{3}{8} \; (?) \; \frac{3}{8} = \frac{3}{4}$
28. $975 \; (?) \; 970 = 5$

LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$20\overline{)179}$	$2\frac{1}{2}$ -2	$34\overline{)82}$	97 $\times 50$	$6\frac{7}{8}$ $-5\frac{1}{8}$
2.	285 $\times 48$	$30\overline{)270}$	$3\frac{1}{4}$ $+8\frac{1}{4}$	$83\overline{)215}$	\$.56 $\times 67$
3.	$94\overline{)256}$	4786 -2999	$9\frac{1}{2}$ $-8\frac{1}{2}$	$9\frac{3}{8}$ $+7\frac{1}{8}$	$47\overline{)239}$

4. Copy and add: \$7.49, \$47.36, \$.95, and \$458.97.

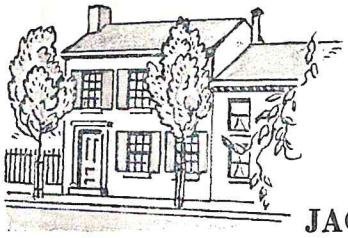
FINDING YOUR DIFFICULTIES IN DIVISION

In the examples below, the remainder is given for each example. You are to find the quotient figure and then to complete the example. If the remainder you get is not the same as the remainder that is given in the example, you either used the incorrect quotient figure, multiplied incorrectly, or made an error in subtraction. Possibly you made more than one of these kinds of errors. If your work is not correct, find the reason for the incorrect work.

	a	*b*	*c*	*d*
1.	r29 76)333	r17 63)521	r16 52)432	r7 35)112
2.	r37 87)472	r19 68)291	r8 73)592	r39 86)555
3.	r48 94)424	r49 83)630	r19 79)414	r14 74)532
4.	r16 67)351	r16 59)193	r19 53)496	r9 36)81
5.	r8 49)155	r7 32)295	r9 62)443	r7 55)392

CHECKING UP ON YOUR WORK

1. How many of the examples above did you work correctly?
2. In how many did you use the incorrect quotient figure?
3. In how many did you multiply incorrectly?
4. In how many did you subtract incorrectly?
5. Did you make more than one kind of error in any of the examples? Be ready to show the errors you made.
6. Did you make any other kinds of errors?



JACK'S SUMMER HOME

1. Jack's parents have a summer home 108 miles from the city where they live. How long would it take them to go to the camp by automobile if they went on the average of 36 miles an hour?

2. Last summer Jack spent the months of June, July, and August at the camp. How many days was this?

3. One day Jack's sister Alice caught two fish, one weighing $3\frac{1}{4}$ pounds and the other $2\frac{1}{4}$ pounds. How much did the two fish weigh?

4. Jack kept a record of the cost of food for the family for the month of July. They spent in all \$62 for the food. How much was that on the average a day?

PRACTICE IN MULTIPLYING AND SUBTRACTING

In the examples below it is necessary to carry in multiplication. The quotient figure is given for each example. You are to complete the work to find the remainder. Then check your answer.

	a	*b*	*c*	*d*	*e*
1.	$56\overline{)242}$	$68\overline{)281}$	$95\overline{)513}$	$97\overline{)340}$	$94\overline{)693}$
	4	4	5	3	7
2.	$88\overline{)361}$	$92\overline{)800}$	$85\overline{)311}$	$89\overline{)374}$	$93\overline{)700}$
	4	8	3	4	7
3.	$86\overline{)300}$	$77\overline{)203}$	$84\overline{)626}$	$72\overline{)673}$	$56\overline{)184}$
	3	2	7	9	3
4.	$66\overline{)281}$	$33\overline{)205}$	$52\overline{)490}$	$38\overline{)84}$	$45\overline{)233}$
	4	6	9	2	5

MORE PRACTICE IN DIVISION

These examples are more difficult than any that you have been working. Watch these steps in division carefully.

1. Test for the quotient figure. Be sure that you divide correctly.
2. Write the quotient figure in the correct place.
3. Multiply the divisor by the quotient figure. Be sure that you multiply correctly. Watch the carrying. If the product is larger than the number you are dividing, your quotient figure is too large.
4. Subtract. If your remainder is as large or larger than the divisor, the quotient is too small.
5. Check your work.

Set I

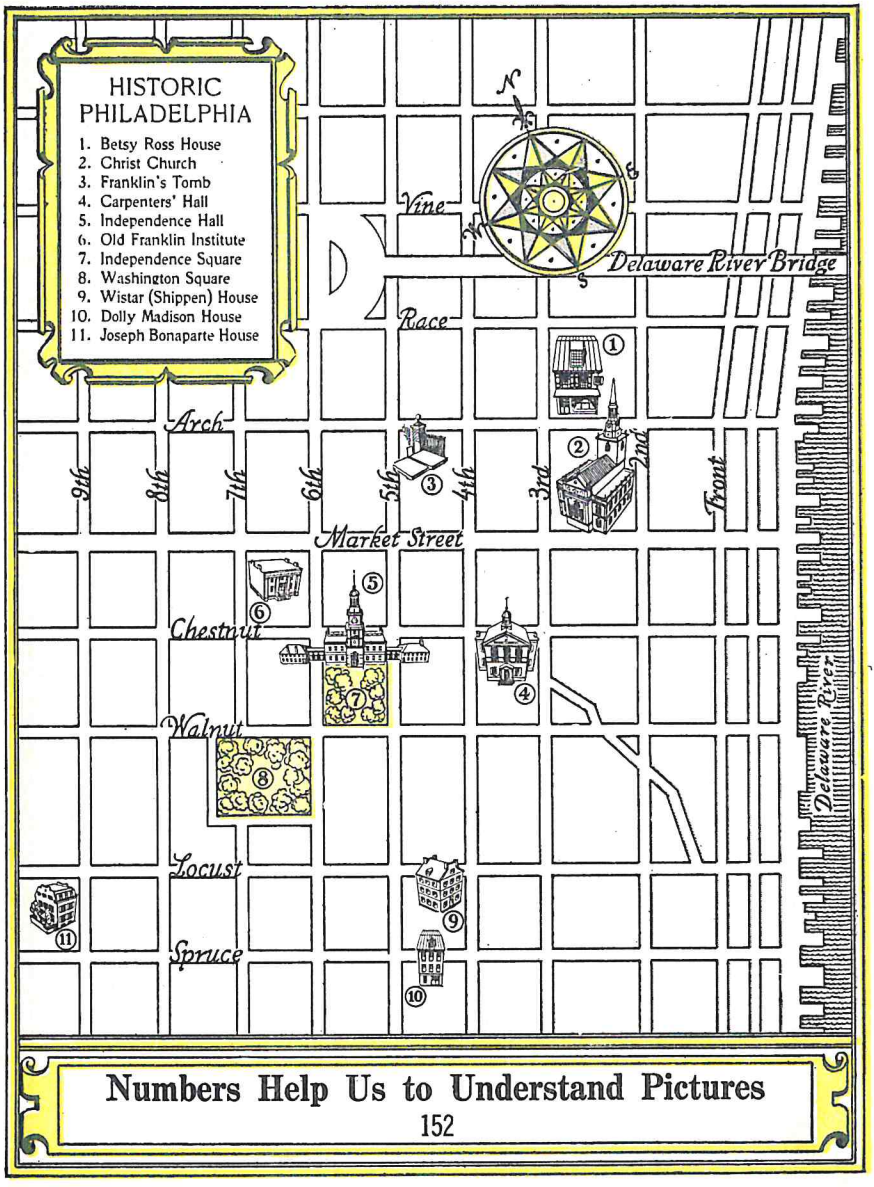
	a	*b*	*c*	*d*	*e*
1.	$45\overline{)233}$	$38\overline{)84}$	$52\overline{)490}$	$33\overline{)205}$	$66\overline{)281}$
2.	$56\overline{)184}$	$72\overline{)673}$	$84\overline{)626}$	$77\overline{)203}$	$86\overline{)300}$

Set II

1.	$93\overline{)700}$	$89\overline{)374}$	$85\overline{)311}$	$92\overline{)800}$	$88\overline{)361}$
2.	$94\overline{)693}$	$97\overline{)340}$	$95\overline{)513}$	$68\overline{)281}$	$56\overline{)247}$

*FOR THOSE WHO NEED MORE PRACTICE

1.	$55\overline{)392}$	$62\overline{)443}$	$32\overline{)295}$	$49\overline{)155}$	$36\overline{)81}$
2.	$53\overline{)496}$	$59\overline{)193}$	$67\overline{)351}$	$74\overline{)532}$	$79\overline{)414}$
3.	$83\overline{)630}$	$94\overline{)424}$	$86\overline{)555}$	$73\overline{)592}$	$68\overline{)291}$
4.	$87\overline{)472}$	$35\overline{)112}$	$52\overline{)432}$	$63\overline{)521}$	$76\overline{)333}$



Numbers Help Us to Understand Pictures

AT THE MOVIE THEATER

1. At the movie theater there are 56 rows of seats with 60 seats in a row. How many seats are there in all?

2. On Saturday afternoon all the seats of the theater were filled by the children. If each child paid 15 cents, how much was taken in from the sale of the tickets? How much would tickets for your class cost? Are prices by day the same as by night?

3. In a recent year there were in all 10,657,306 seats in movie theaters in this country. Write this number in words.

4. That year there were 90,344 movie theaters in all in the world. There were 18,182 in the United States. How many were there in the rest of the world?

5. How many more theaters were there in the rest of the world that year than in the United States?

*6. How often do you attend movies? Find the amount you spend for movies in a month.

FINDING ERRORS IN DIVISION

These examples contain the kinds of errors that boys and girls most often make in division. Study each example carefully until you find the error. Then copy the example without the work and find the correct answer.

1. $25\overline{)78}$ — 3, 65, 13

2. $68\overline{)276}$ — 4, 262, 14

3. $39\overline{)86}$ — 2, 78, 9

4. $60\overline{)517}$ — 8, 488, 29

5. $84\overline{)600}$ — 7, 588, 2

6. $76\overline{)690}$ — 9, 686, 4

7. $45\overline{)319}$ — 6, 270, 39

8. $36\overline{)328}$ — 8, 288

DIAGNOSTIC TEST IN DIVISION

If you make more than two errors in a row of examples, turn for help to the pages given at the right.

Part I

	a	*b*	*c*	*d*	
1.	$10\overline{)40}$	$10\overline{)60}$	$10\overline{)47}$	$10\overline{)78}$	**(130)**
2.	$20\overline{)60}$	$40\overline{)80}$	$30\overline{)75}$	$20\overline{)69}$	**(132)**
3.	$30\overline{)150}$	$40\overline{)320}$	$20\overline{)140}$	$60\overline{)540}$	**(135)**
4.	$30\overline{)127}$	$50\overline{)358}$	$80\overline{)374}$	$70\overline{)595}$	**(135)**

Part II

5.	$22\overline{)88}$	$11\overline{)44}$	$13\overline{)39}$	$43\overline{)86}$	**(137)**
6.	$31\overline{)155}$	$21\overline{)168}$	$53\overline{)159}$	$72\overline{)288}$	**(137)**
7.	$12\overline{)39}$	$21\overline{)87}$	$50\overline{)142}$	$61\overline{)429}$	**(139)**
8.	$21\overline{)70}$	$61\overline{)131}$	$42\overline{)90}$	$74\overline{)182}$	**(139)**

Part III

9.	$35\overline{)72}$	$74\overline{)296}$	$45\overline{)228}$	$98\overline{)588}$	**(142)**
10.	$36\overline{)81}$	$39\overline{)84}$	$37\overline{)80}$	$38\overline{)85}$	**(142)**
11.	$67\overline{)411}$	$41\overline{)265}$	$87\overline{)471}$	$53\overline{)272}$	**(145)**
12.	$94\overline{)692}$	$88\overline{)371}$	$76\overline{)335}$	$68\overline{)280}$	**(145)**

*INTERESTING FACTS TO FIND OUT

1. How my parents use long division.
2. The prices of movies where we live.
3. How boys and girls earn money.
4. Prices of gasoline at different stations.

"WHAT CAN WE DO FOR CHRISTMAS?"

The fifth-grade class at the Tuttle school wanted to give presents to poor children at Christmas. They decided to earn the money. Here is what the class did:

1. First they bought 30 dozen small poinsettia plants. How many plants are there in 30 dozen?
2. They paid 10¢ for each plant. How much did the plants cost in all?
3. Next, they bought some green paper for 70¢ and some red ribbon for $1.80. How much did they spend for paper and ribbon?
4. After they had decorated each plant with green paper and a red ribbon bow, they sold them for 15¢ each. How much did they get for the 360 plants?
5. Each plant they sold for 15¢ cost the class 10¢. How much did they make on each plant? How much did they make on 360 plants?
6. From this amount they had to subtract the expense of decorating the plants. How much were these expenses? How much did they have left? This was their **profit.**
7. With this money, they bought 28 pairs of warm mittens for children who needed mittens. At 55¢ a pair, how much did they spend on mittens?

*8. Was there any money left? How much?

TEST ON DIVISION WITH ONE-FIGURE QUOTIENTS

If you work all of the examples in this test correctly, you have learned very well how to divide by two-figure numbers.

1. $21\overline{)63}$
2. $21\overline{)97}$
3. $34\overline{)107}$
4. $56\overline{)237}$
5. $63\overline{)283}$
6. $75\overline{)230}$
7. $92\overline{)654}$
8. $83\overline{)752}$
9. $78\overline{)160}$
10. $14\overline{)29}$
11. $46\overline{)238}$
12. $96\overline{)500}$
13. $81\overline{)654}$
14. $65\overline{)342}$
15. $44\overline{)312}$

How many of the fifteen examples did you work correctly? If you made any errors, review again page 154 and try to find the reasons for your errors. Then correct your work.

A QUICK REVIEW OF FRACTIONS

1. Is $\frac{6}{8}$ reduced to lowest terms? How can you tell?
2. Express the number $4\frac{2}{4}$ in simplest form.
3. In the fraction $\frac{4}{5}$ what do we call the 4? the 5?
4. Which is most, $\frac{1}{2}$, $\frac{1}{4}$, or $\frac{1}{8}$?

Find the answers to these examples:

5. $3\frac{1}{4} + 2\frac{1}{4} + 27\frac{1}{4} =$
6. $7\frac{1}{8} + \frac{3}{8} + 6\frac{1}{8} =$
7. $\frac{1}{6} + \frac{1}{6} + 5\frac{1}{6} =$
8. $6\frac{1}{2} + 5 + 8 =$

Subtract:

9. $8\frac{1}{2} - 2\frac{1}{2} =$
10. $6\frac{7}{8} - 5\frac{1}{8} =$
11. $5\frac{3}{4} - 2\frac{1}{4} =$
12. $7\frac{1}{4} - 5 =$
13. $\frac{3}{4}$ yd. $- \frac{1}{4}$ yd. $=$
14. $9\frac{3}{4}$ mi. $- 5\frac{3}{4}$ mi. $=$
15. $6\frac{1}{2}$ gal. $- 4\frac{1}{2}$ gal. $=$
16. $7\frac{7}{10}$ hr. $- 5\frac{3}{10}$ hr. $=$

*17. Make up problems using the numbers in examples 13 to 16.

HOW WELL DO YOU REMEMBER?

QUIZ D

1. Give the steps in working this example: $44\overline{)270}$.

2. Show how multiplication is used in working the example.

3. How is subtraction used in working the example?

4. Where is the final remainder written in the example?

5. How do you check the answer to the example?

6. What are three kinds of errors boys and girls make in dividing by two-place numbers?

7. Tell what is wrong in these three examples:

$$\begin{array}{rr} & 2 \\ a.\ 48\overline{)} & 101 \\ & 96 \\ \hline & 4 \end{array} \qquad \begin{array}{rr} & 5 \\ b.\ 65\overline{)} & 407 \\ & 325 \\ \hline & 82 \end{array} \qquad \begin{array}{rr} & 8 \\ c.\ 76\overline{)} & 628 \\ & 606 \\ \hline & 2 \end{array}$$

Copy the examples without the work and find the correct answers.

8. Reduce to lowest terms: $\frac{4}{8}$; $\frac{10}{12}$; $\frac{8}{16}$.

9. Show that $6\frac{6}{6} = 6\frac{3}{4}$.

10. Explain each step of the work in the example in the box at the right.

11. To check the answer to this example by addition, the sum of what two numbers must you find? Check the answer.

$$\begin{array}{r} 7\frac{3}{4} \\ -2\frac{1}{4} \\ \hline 5\frac{2}{4} = 5\frac{1}{2} \end{array}$$

12. How can you find, by counting, the number of 20's there are in 80? in 140? Find the number by counting and by dividing. Which method is easier?

13. If you subtract 20 from 80, then 20 from the remainder, and so on, how many times do you subtract 20 before the result is 0? Is division like addition or subtraction?

14. How many halves are there in 1? how many fourths?

LET'S PRACTICE

Each set of examples contains some of the kinds of examples you have learned to work. Use one set of examples a day for practice. Do not be satisfied until you can work all of the examples in each set quickly and correctly.

Set I

1. $\begin{array}{r} 696 \\ 892 \\ 97 \\ 848 \\ 689 \\ 178 \\ \hline \end{array}$

2. $\begin{array}{r} \frac{1}{4} \\ +\frac{1}{4} \\ \hline \end{array}$

3. $\begin{array}{r} 38 \\ \times 40 \\ \hline \end{array}$

4. $8\overline{)60}$

5. $10\overline{)87}$

6. $\begin{array}{r} \frac{7}{8} \\ -\frac{3}{8} \\ \hline \end{array}$

7. $\frac{1}{3}$ of 48 =

8. $53\overline{)111}$

9. $\begin{array}{r} 13790 \\ -6827 \\ \hline \end{array}$

10. $32\overline{)70}$

Set II

1. $\begin{array}{r} \$5.65 \\ 8.65 \\ .61 \\ .09 \\ 94.76 \\ 5.71 \\ \hline \end{array}$

2. $\begin{array}{r} \frac{3}{8} \\ +\frac{3}{8} \\ \hline \end{array}$

3. $20\overline{)47}$

4. $\begin{array}{r} 12000 \\ -3727 \\ \hline \end{array}$

5. $73\overline{)301}$

6. $\begin{array}{r} 375 \\ \times 56 \\ \hline \end{array}$

7. $\begin{array}{r} 9\frac{7}{8} \\ -2\frac{1}{8} \\ \hline \end{array}$

8. $\frac{1}{2}$ of 36 =

9. $\begin{array}{r} 2\frac{1}{4} \\ +3\frac{1}{4} \\ \hline \end{array}$

10. $89\overline{)268}$

USING THE VOCABULARY OF ARITHMETIC

Write sentences showing how we use the words below.

price	purchase	square	mixed number
market	denominator	reducing	diagnostic test
ten	expensive	fine	subscription
terms	sale	numerator	average

MEASURING GROWTH IN PROBLEM SOLVING

1. There are 902 pupils in the Lee School. One day 27 pupils were absent. How many were present?

2. If Patty deposits $.06 a week in her savings bank, how much does she deposit in 8 weeks?

3. How many weeks are there in 364 days?

4. Jack often helps his father in the store. One Friday he worked $2\frac{1}{4}$ hours and on Saturday $6\frac{1}{4}$ hours. How many hours did he help in the store in the two days?

5. It is 180 miles from Kate's house to where her grandmother lives. How long does it take them to drive the distance if they average 45 miles an hour?

6. An arithmetic textbook costs $.80. Find the cost of arithmetic textbooks for a class of 36 children.

7. Tom rode by airplane from near Chicago to New York, a distance of 900 miles. The trip took 6 hours. How many miles did they go in an hour?

8. Mary has 50 cents to spend at the fair. If she pays 20 cents for a ticket, how many nickels does she still have to spend?

9. Jane bought 15 3-cent Christmas post cards and 16 5-cent post cards. How much did she spend in all for the post cards she bought?

10. Each week the Smith family uses 14 quarts of milk. How much does the milk they use in 4 weeks cost if the milk costs 12 cents a quart?

What Your Score Means

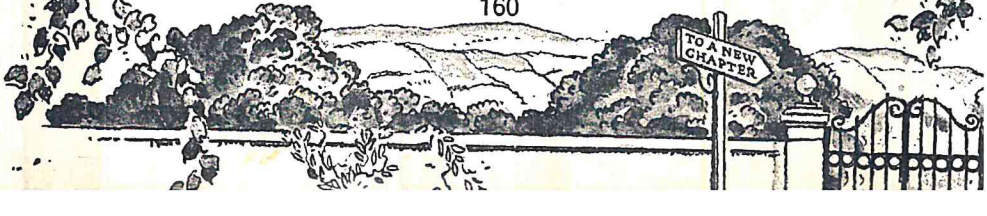
Unsatisfactory	Fair	Good	Excellent
0 1 2 3 4	5 6	7 8	9 10

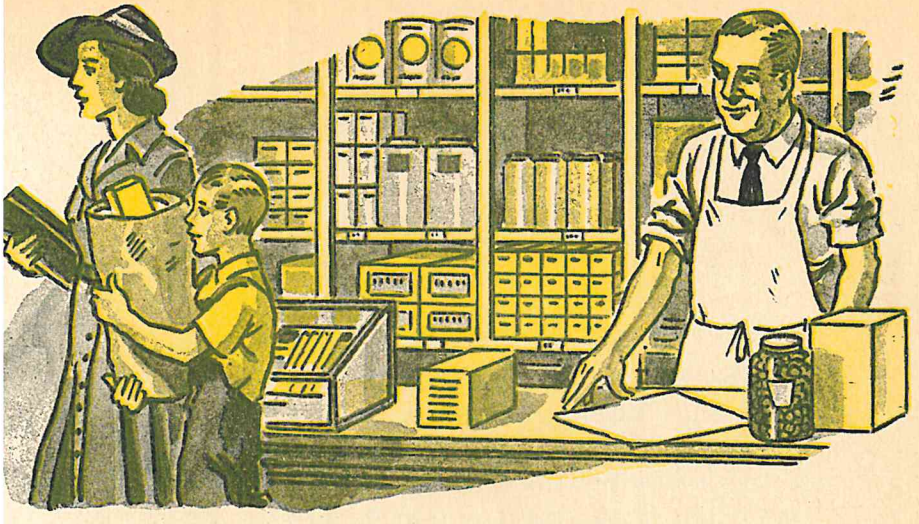
OPENING THE GATE TO THE NEW CHAPTER

This test will help you to find how well you can work the kinds of examples you have studied.

1.	Add: \$3.75, \$89.60, \$.97, and \$4.62	(14)
2.	Subtract: \$375.68 from \$1000.	(17)
3.	Multiply: $30 \times 86 = ?$	(49)
4.	Multiply: $27 \times \$3.59 = ?$	(70)
5.	Divide 87 by 6 and check your answer.	(33)
6.	Reduce to lowest terms: $\frac{10}{12}$, $\frac{10}{16}$.	(94)
7.	How much is $\frac{1}{8} + \frac{3}{8}$?	(91)
8.	Add these numbers: $9\frac{1}{4} + 6\frac{1}{4} = ?$	(102)
9.	Subtract: 5 feet from $6\frac{1}{4}$ feet.	(117)
10.	Find the remainder: $8\frac{1}{2} - 2\frac{1}{2} = ?$	(116)
11.	How much less than $6\frac{3}{4}$ inches is $5\frac{1}{4}$ inches?	(114)
12.	Divide 180 by 60. Check your answer.	(135)
13.	$\frac{188}{94} = ?$	(137)
14.	Divide 359 by 51.	(137)
15.	Divide 80 by 32. Check your answer.	(141)
16.	Divide 79 by 25.	(142)
17.	Divide 370 by 74.	(145)
18.	Divide 83 by 38. Check your answer.	(145)
19.	Divide 266 by 41.	(141)
20.	Divide 370 by 88. Check your answer.	(145)

After your paper is marked, study and do again the examples you worked incorrectly. If you need help, turn to the pages given at the right. Do not be satisfied until you can do all of the work in this test easily and correctly.





CHAPTER V

FRACTIONS AND GROCERIES GO TOGETHER

Ralph sometimes helps his father at the grocery store. He sells some things and often carries out to their automobiles the bags of things that the people buy.

1. How much should Ralph charge for $\frac{1}{2}$ pound of butter if butter sells for 36 cents a pound?

2. How much do $\frac{1}{4}$ dozen oranges cost at 56 cents a dozen?

3. Ralph sold a loaf of cake for 11 cents. How much change should he give from a quarter? from a half dollar?

4. How many cents more than a quarter is a half dollar?

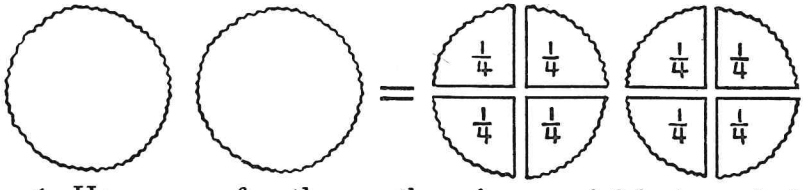
5. Ralph went to the store one morning at quarter to nine. How many minutes after 8 o'clock was that?

6. A lady wanted to buy $\frac{1}{4}$ pound of candy. How many ounces should Ralph give her?

*7. Name units of measure that are used at the grocery store.

CUTTING PIES

Susan has cut these pies into fourths.



1. How many fourths are there in one pie? in two pies?

2. For dinner Susan gave each of 7 persons $\frac{1}{4}$ of a pie. That would be how many fourths? That would be one whole pie and how many fourths of the other pie?

3. One night Susan used 3 fourths of one pie and 2 fourths of another pie. How many fourths did she use?

$$\frac{3}{4} + \frac{2}{4} = \frac{?}{4}$$

4. How much more than a whole pie did she use?

You can see that $\frac{5}{4}$ pie $= \frac{4}{4}$ pie and $\frac{1}{4}$ pie, or $1\frac{1}{4}$ pies.

5. Show by the pies above that 6 fourths $(\frac{6}{4})$ equals one whole pie and 2 fourths of another pie.

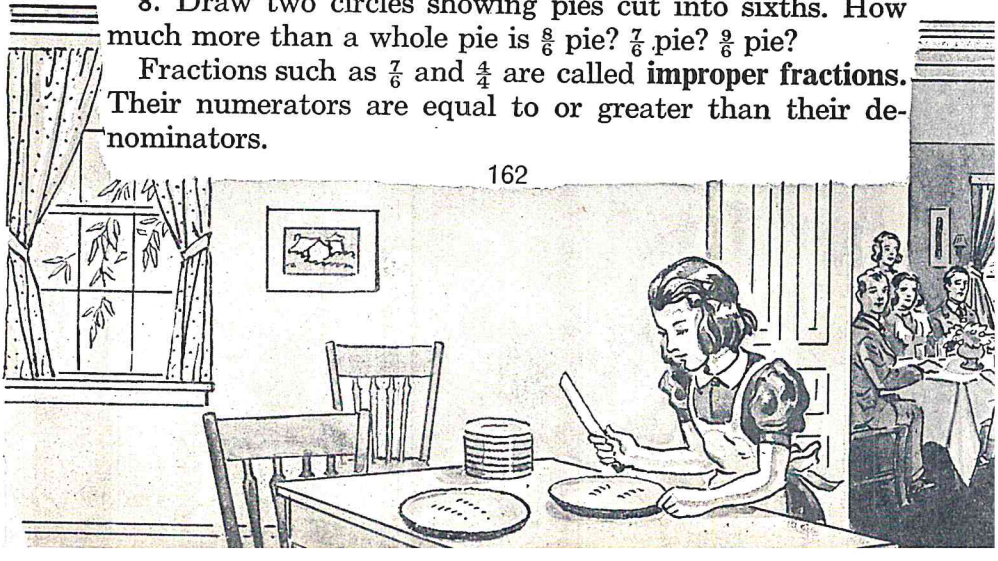
$$\frac{6}{4} = \frac{4}{4} + \frac{?}{4}$$

6. Show that 2 fourths and 2 fourths are a whole thing.

7. How much more than a whole pie are 3 half pies?

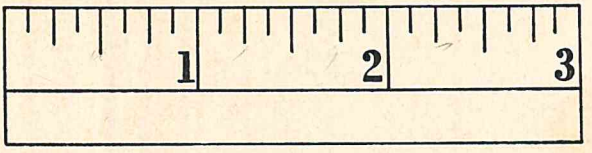
8. Draw two circles showing pies cut into sixths. How much more than a whole pie is $\frac{8}{6}$ pie? $\frac{7}{6}$ pie? $\frac{9}{6}$ pie?

Fractions such as $\frac{7}{6}$ and $\frac{4}{4}$ are called **improper fractions.** Their numerators are equal to or greater than their denominators.



STUDYING FRACTIONS WITH A RULER

The piece of a ruler pictured below shows some of the fractions of an inch we often use.



1. How many half inches are there in 1 inch? how many quarter inches? how many eighth inches?

2. How many half inches are there in 2 inches? how many quarter inches? how many eighth inches?

3. How many half inches are there in $1\frac{1}{2}$ inches?

4. How many quarter inches are there in $1\frac{1}{4}$ inches? in $1\frac{3}{4}$ inches? in $1\frac{1}{2}$ inches?

5. How many eighth inches are there in $1\frac{3}{8}$ inches?

6. How much more than 1 inch is three half inches?

By studying the ruler you can see that $\frac{3}{2}$ in. is $\frac{1}{2}$ in. more than 1 inch. Thus, $\frac{3}{2}$ in. $= 1\frac{1}{2}$ in.

7. How much more than 1 inch is 5 quarter inches? 6 quarter inches? 7 quarter inches?

8. Express as inches and fractions of an inch: $\frac{5}{4}$ inches; $\frac{6}{4}$ inches; $\frac{3}{2}$ inches.

9. Supply the missing terms:

$\frac{9}{8}$ in. $= 1\frac{?}{8}$ in.; $\frac{11}{8}$ in. $= 1\frac{?}{8}$ in.; $\frac{15}{8}$ in. $= 1\frac{?}{8}$ in.

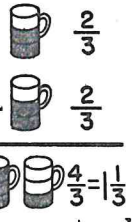
10. If a line is $\frac{5}{2}$ inches long, how much longer than 2 inches is it?

11. If a line is $\frac{8}{4}$ inches long, how many inches long is it?

12. Which is more, $\frac{4}{4}$ inch or $1\frac{1}{4}$ inches?

CHANGING THE FORM OF IMPROPER FRACTIONS

1. Alice used $\frac{2}{3}$ cup of white sugar and $\frac{2}{3}$ cup of brown sugar to make some candy. How much sugar did she use in all?



THINK: $\frac{2}{3}$ cup + $\frac{2}{3}$ cup = ? cups.
Add: $\frac{2}{3} + \frac{2}{3} = \frac{4}{3}$.
One cup is equal to $\frac{3}{3}$ cup, and $\frac{4}{3}$ is $\frac{1}{3}$ more than $\frac{3}{3}$. So $\frac{4}{3}$ cup is equal to one and one-third cups, or $1\frac{1}{3}$ cups.

An easy way to change an improper fraction such as $\frac{4}{3}$ to simpler form is to divide the numerator by the denominator. Thus: $\frac{4}{3} = 3\overline{)4}$ or $1\frac{1}{3}$; $\frac{2}{2} = 2\overline{)2}$ or 1; $\frac{8}{4} = 4\overline{)8}$ or 2.

2. Study the following examples carefully:

a. $\frac{5}{4} = 4\overline{)5} = 1\frac{1}{4}$ *d.* $\frac{6}{4} = 4\overline{)6} = 1\frac{2}{4} = 1\frac{1}{2}$

b. $\frac{11}{4} = 4\overline{)11} = 2\frac{3}{4}$ *e.* $\frac{10}{6} = 6\overline{)10} = 1\frac{4}{6} = 1\frac{2}{3}$

c. $\frac{6}{3} = 3\overline{)6} = 2$ *f.* $\frac{20}{8} = 8\overline{)20} = 2\frac{4}{8} = 2\frac{1}{2}$

Whenever the answer to an example is in the form of an improper fraction, it should be changed to a whole or mixed number. If the mixed number contains a fraction, it should be reduced to lowest terms.

Change these improper fractions to whole or mixed numbers. Write each answer in its simplest form.

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
3.	$\frac{4}{3}$	$\frac{9}{5}$	$\frac{8}{6}$	$\frac{5}{4}$	$\frac{7}{6}$	$\frac{2}{2}$	$\frac{6}{4}$	$\frac{5}{5}$
4.	$\frac{8}{2}$	$\frac{9}{6}$	$\frac{11}{4}$	$\frac{14}{8}$	$\frac{9}{3}$	$\frac{6}{6}$	$\frac{10}{8}$	$\frac{16}{4}$

5. Change each of these fractions to its simplest form:

$\frac{6}{8}$ $\frac{7}{4}$ $\frac{20}{20}$ $\frac{9}{12}$ $\frac{63}{21}$ $\frac{250}{50}$ $\frac{90}{30}$ $\frac{96}{48}$

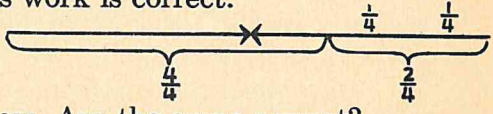
IMPROPER FRACTIONS IN ADDITION

1. John lives $\frac{3}{4}$ mile from school. How far is it to school and home again?

THINK: $\frac{3}{4}$ mi. + $\frac{3}{4}$ mi. = ? mi. Add $\frac{3}{4}$ and $\frac{3}{4}$. The sum, $\frac{6}{4}$, is an improper fraction. Reduce: $\frac{6}{4} = 1\frac{2}{4}$, or $1\frac{1}{2}$. John walks $1\frac{1}{2}$ miles.

$$\begin{array}{r} \frac{3}{4} \\ +\frac{3}{4} \\ \hline \frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2} \end{array}$$

Count the fourths in the diagram below to prove that this work is correct.

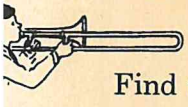


2. Study the examples below. Are the sums correct?

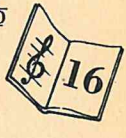
a. $\begin{array}{r} \frac{4}{5} \\ +\frac{3}{5} \\ \hline \frac{7}{5} = 1\frac{2}{5} \end{array}$ *b.* $\begin{array}{r} \frac{5}{6} \\ +\frac{5}{6} \\ \hline \frac{10}{6} = 1\frac{4}{6} = 1\frac{2}{3} \end{array}$ *c.* $\begin{array}{r} \frac{2}{3} \\ +\frac{1}{3} \\ \hline \frac{3}{3} = 1 \end{array}$ *d.* $\begin{array}{r} \frac{1}{2} \\ +\frac{1}{2} \\ \hline \frac{2}{2} = 1 \end{array}$

3. Find these sums with your book closed:

	a	*b*	*c*	*d*	*e*	*f*	*g*
4.	$\begin{array}{r} \frac{2}{3} \\ +\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} \frac{3}{4} \\ +\frac{2}{4} \\ \hline \end{array}$	$\begin{array}{r} \frac{1}{3} \\ +\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} \frac{5}{6} \\ +\frac{5}{6} \\ \hline \end{array}$	$\begin{array}{r} \frac{3}{5} \\ +\frac{3}{5} \\ \hline \end{array}$	$\begin{array}{r} \frac{5}{8} \\ +\frac{5}{8} \\ \hline \end{array}$	$\begin{array}{r} \frac{1}{2} \\ +\frac{1}{2} \\ \hline \end{array}$
5.	$\begin{array}{r} \frac{7}{8} \\ +\frac{5}{8} \\ \hline \end{array}$	$\begin{array}{r} \frac{5}{6} \\ +\frac{1}{6} \\ \hline \end{array}$	$\begin{array}{r} \frac{3}{4} \\ +\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} \frac{1}{4} \\ +\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} \frac{5}{8} \\ +\frac{7}{8} \\ \hline \end{array}$	$\begin{array}{r} \frac{5}{8} \\ +\frac{3}{8} \\ \hline \end{array}$	$\begin{array}{r} \frac{7}{10} \\ +\frac{9}{10} \\ \hline \end{array}$



LET'S PRACTICE



Find the sums:

	a	*b*	*c*	*d*	*e*	*f*	*g*
1.	$\begin{array}{r} \frac{1}{3} \\ +\frac{1}{3} \\ \hline \end{array}$	$\begin{array}{r} \frac{1}{2} \\ +\frac{1}{2} \\ \hline \end{array}$	$\begin{array}{r} 3\frac{1}{4} \\ +\frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} \frac{5}{8} \\ +\frac{7}{8} \\ \hline \end{array}$	$\begin{array}{r} \frac{3}{8} \\ +\frac{1}{8} \\ \hline \end{array}$	$\begin{array}{r} \frac{1}{4} \\ +\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 5 \\ +3\frac{3}{4} \\ \hline \end{array}$
2.	$\begin{array}{r} 2\frac{2}{5} \\ +3\frac{2}{5} \\ \hline \end{array}$	$\begin{array}{r} 2\frac{1}{4} \\ +3 \\ \hline \end{array}$	$\begin{array}{r} \frac{7}{8} \\ +\frac{3}{8} \\ \hline \end{array}$	$\begin{array}{r} \frac{5}{8} \\ +\frac{3}{8} \\ \hline \end{array}$	$\begin{array}{r} \frac{2}{3} \\ +5 \\ \hline \end{array}$	$\begin{array}{r} \frac{3}{4} \\ +\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 2\frac{1}{5} \\ +9\frac{3}{5} \\ \hline \end{array}$

'WAY DOWN UPON THE SWANEE RIVER

Way down up on the Swa nee Ri ver, Far, far a way

These are the notes we use in music:

𝅝 whole note	♩ quarter note
𝅗𝅥 half note	♪ eighth note

1. Which of these notes can you find in the song above? Which of these notes do we hold longest when singing?

2. A whole note is held how many times as long as a half note? as a quarter note? as an eighth note?

$1 = \frac{?}{2}$ $1 = \frac{?}{4}$ $1 = \frac{?}{8}$

3. How many quarter notes take as much time as a half note? $\frac{1}{2} = \frac{?}{4}$

4. How many eighth notes take as much time as a half note? as a quarter note? $\frac{1}{2} = \frac{?}{8}$; $\frac{1}{4} = \frac{?}{8}$

5. A whole note and two half notes make how many half notes? how many whole notes?

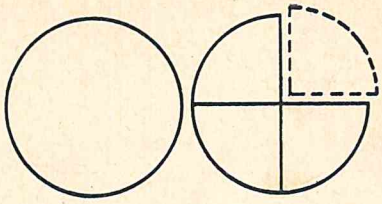
6. A half note and two quarter notes make how many quarter notes? how many whole notes?

7. A quarter note and four eighth notes make how many eighth notes?

*8. A rest (𝄾) is given the same time as an eighth note. See if the notes and the rest in the measure at the right add up to $\frac{6}{8}$.

*9. What is meant by the "time measure" of a song? What does the $\frac{4}{4}$ in the song at the top of the page mean? Find songs with other "time measures."

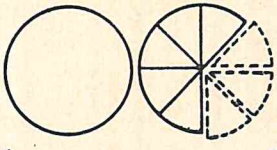
LET'S TELL THE STORIES



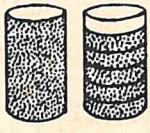
The drawing at the right pictures the four examples below. Explain. Make number problems about each.

a. $1\frac{3}{4} + \frac{1}{4}$ *b.* $\frac{1}{4} + 1\frac{3}{4}$ *c.* $2 - \frac{1}{4}$ *d.* $2 - 1\frac{3}{4}$

What are the four stories told by each of the drawings below?



1.



2.

3.

PRACTICE IN DIVISION

Check the first example in each row. If it is correct, you need not check the other examples.

Set I

	a	*b*	*c*	*d*	*e*
1.	$20\overline{)61}$	$31\overline{)64}$	$43\overline{)86}$	$52\overline{)57}$	$23\overline{)48}$
2.	$30\overline{)187}$	$60\overline{)243}$	$42\overline{)129}$	$73\overline{)148}$	$93\overline{)189}$
3.	$51\overline{)268}$	$72\overline{)186}$	$21\overline{)119}$	$62\overline{)289}$	$83\overline{)197}$

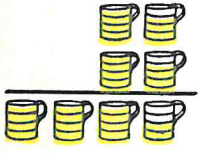
Set II

1.	$54\overline{)120}$	$83\overline{)263}$	$71\overline{)382}$	$94\overline{)190}$	$62\overline{)273}$
2.	$67\overline{)347}$	$75\overline{)617}$	$84\overline{)769}$	$56\overline{)398}$	$96\overline{)599}$
3.	$77\overline{)620}$	$54\overline{)492}$	$66\overline{)535}$	$87\overline{)360}$	$95\overline{)491}$

CARRYING IN ADDITION OF FRACTIONS

1. Mother made orange sherbet for dessert. She used $1\frac{3}{4}$ cups of orange juice and $1\frac{3}{4}$ cups of milk. How many cups of orange juice and milk did she use?

THINK: $1\frac{3}{4}$ cups $+$ $1\frac{3}{4}$ cups $=$? cups.



$$1\tfrac{3}{4}$$
$$1\tfrac{3}{4}$$
$$2\tfrac{6}{4} = 2 + 1\tfrac{2}{4} =$$
$$3\tfrac{2}{4} = 3\tfrac{1}{2}$$

Add the fractions: $\frac{3}{4} + \frac{3}{4} = \frac{6}{4}$.
Add the whole numbers: $1 + 1 = 2$.
Since $\frac{6}{4} = 1\frac{2}{4}$, $2\frac{6}{4} = 2 + 1\frac{2}{4}$, or $3\frac{2}{4}$.
Change $3\frac{2}{4}$ to $3\frac{1}{2}$. Why?
She used $3\frac{1}{2}$ cups of orange juice and milk.

2. Study the following examples until you understand them. Then copy and work them with your book closed.

a. $3\frac{2}{3}$, $1\frac{2}{3}$, $4\frac{4}{3} = 4 + 1\frac{1}{3} = 5\frac{1}{3}$

b. $8\frac{1}{2}$, $\frac{1}{2}$, $8\frac{2}{2} = 8 + 1 = 9$

c. $\frac{7}{8}$, $4\frac{5}{8}$, $4\frac{12}{8} = 4 + 1\frac{4}{8} = 5\frac{1}{2}$

When the sum is a mixed number containing an improper fraction (1) change the improper fraction to a whole or mixed number, (2) add the two parts of the answer, (3) if there then is a fraction in the answer, be sure to reduce it to lowest terms. Thus, $3\frac{9}{6} = 3 + 1\frac{3}{6} = 4\frac{3}{6} = 4\frac{1}{2}$.

3. Express each of the following in its simplest form:

$7\frac{7}{4}$ $9\frac{3}{2}$ $6\frac{4}{4}$ $4\frac{4}{8}$ $6\frac{6}{4}$ $8\frac{6}{5}$ $7\frac{2}{2}$

4. Find the weight of two pieces of roast beef, one weighing $3\frac{1}{4}$ pounds, the other $4\frac{3}{4}$ pounds.

Add:

	a	*b*	*c*	*d*	*e*	*f*	*g*
5.	$7\frac{2}{3}$	$6\frac{3}{4}$	$7\frac{4}{5}$	$6\frac{2}{3}$	$8\frac{7}{8}$	$8\frac{3}{5}$	$7\frac{1}{2}$
	$4\frac{2}{3}$	$5\frac{1}{4}$	$5\frac{2}{5}$	$4\frac{1}{3}$	$\frac{1}{8}$	$\frac{3}{5}$	$4\frac{1}{2}$

USING A RULER TO ADD FRACTIONS

You can use a ruler to find the sum of two or more fractions, or to prove that the sum of two or more fractions you have added is correct.

1. The line below has two parts. How long is each part?

2. Use your ruler to measure the length of the line. How much is $1\frac{1}{4}'' + 1\frac{3}{4}''$?

3. Show by adding $1\frac{1}{4}$ and $1\frac{3}{4}$ that their sum is the same as the length of the line in inches.

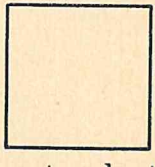
4. Draw a line $\frac{3}{4}$ inch long. Then make the line $1\frac{1}{4}$ inches longer. Measure the line with your ruler. Show by adding $\frac{3}{4}$ inch and $1\frac{1}{4}$ inches that the length of the line is the same as the sum of the two numbers.

5. First add the numbers in an example to find their sum. Then with your ruler draw a line showing the lengths given and measure the line. Are the results you get the same?

a. $2\frac{1}{4}'' + 1\frac{3}{4}'' =$ *c.* $2\frac{3}{4}'' + 1\frac{3}{4}'' + \frac{3}{4}'' =$

b. $1\frac{3}{8}'' + 1\frac{5}{8}'' =$ *d.* $2\frac{1}{2}'' + 3\frac{1}{2}'' + \frac{1}{2}'' =$

6. Use your ruler to measure the length of each side of the square at the right. Then find the sum of the lengths of the four sides to get the distance around the square (its perimeter).

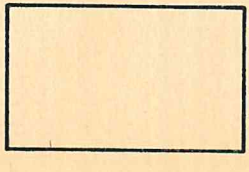


7. Measure the lengths of the sides of the rectangle, the triangle, and the square below and find the perimeter of each figure.

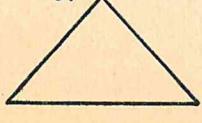
*8. Draw a rectangle $2\frac{1}{2}$ inches long and $1\frac{1}{2}$ inches wide.

*9. What kind of corners do squares and rectangles have?

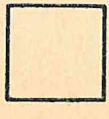
a.



b.



c.



ARITHMETIC IN THE KITCHEN

1. Mary wants to bake 100 cookies. She can bake 10 in one pan. How many pans of cookies must she bake?

2. Her mother bought two pieces of meat. Mary weighed them on the scale. One piece weighed $3\frac{3}{4}$ pounds, the other weighed $2\frac{1}{4}$ pounds. How much did the two pieces weigh?

3. Her mother baked two small cakes. She cut each cake into quarters. How many pieces of cake were there?

4. Mary measured 3 cups of milk for her mother. A cup of milk is equal to $\frac{1}{4}$ quart. What part of a quart is 3 cups of milk? 2 cups of milk?

5. Mary said, "We use about $\frac{3}{4}$ pound of butter each day." How much butter do they use in 3 days?

6. A 6-pound roast should bake in the oven about $3\frac{1}{4}$ hours. If the roast is to be ready to eat at 6:15, when should it be put into the oven?

*7. What are some of the measures used in the kitchen?

LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$\frac{3}{4}$ $-\frac{1}{4}$	79 $\times 80$	$48\frac{2}{3}$ $-39\frac{1}{3}$	$48\overline{)193}$	$36\frac{1}{8}$ $+73\frac{5}{8}$
2.	$76\overline{)621}$	$2\frac{1}{2}$ $+\frac{1}{2}$	\$3.86 $\times 75$	$\frac{7}{8}$ $-\frac{3}{8}$	$33\overline{)204}$
3.	39061 -27386	$24\frac{3}{4}$ $-7\frac{3}{4}$	$\frac{1}{4}$ of 392 =	$84\overline{)701}$	$7\frac{7}{8}$ $+6\frac{5}{8}$

4. \$9.78 + \$67.25 + \$.37 + \$.09 = ?

PRACTICE IN REDUCING FRACTIONS

Reduce these fractions to lowest terms:

1. $\frac{4}{8}$, $\frac{2}{4}$, $\frac{6}{8}$
2. $\frac{6}{12}$, $\frac{5}{10}$, $\frac{2}{10}$
3. $\frac{4}{12}$, $\frac{8}{12}$, $\frac{2}{12}$
4. $\frac{2}{8}$, $\frac{8}{10}$, $\frac{4}{6}$
5. $\frac{2}{6}$, $\frac{3}{6}$, $\frac{6}{9}$
6. $\frac{3}{9}$, $\frac{4}{10}$, $\frac{6}{10}$
7. $\frac{6}{12}$, $\frac{3}{12}$, $\frac{9}{12}$
8. $\frac{10}{12}$, $\frac{7}{14}$, $\frac{10}{14}$
9. $\frac{8}{14}$, $\frac{5}{15}$, $\frac{3}{15}$
10. $\frac{6}{15}$, $\frac{10}{15}$, $\frac{9}{15}$
11. $\frac{8}{16}$, $\frac{4}{16}$, $\frac{12}{16}$
12. $\frac{8}{20}$, $\frac{10}{20}$, $\frac{15}{20}$

Some of the fractions below are reduced to lowest terms. Name these fractions. Then reduce the other fractions to lowest terms. Do not use a pencil.

13. $\frac{1}{2}$, $\frac{2}{8}$, $\frac{4}{6}$
14. $\frac{3}{6}$, $\frac{3}{4}$, $\frac{3}{7}$
15. $\frac{4}{8}$, $\frac{2}{4}$, $\frac{3}{8}$
16. $\frac{5}{6}$, $\frac{4}{10}$, $\frac{6}{9}$
17. $\frac{6}{12}$, $\frac{7}{8}$, $\frac{7}{14}$
18. $\frac{4}{5}$, $\frac{10}{12}$, $\frac{5}{8}$
19. $\frac{4}{6}$, $\frac{10}{14}$, $\frac{7}{10}$
20. $\frac{5}{12}$, $\frac{6}{8}$, $\frac{5}{10}$
21. $\frac{9}{10}$, $\frac{4}{16}$, $\frac{7}{12}$
22. $\frac{7}{15}$, $\frac{8}{12}$, $\frac{8}{16}$
23. $\frac{7}{10}$, $\frac{12}{16}$, $\frac{9}{15}$
24. $\frac{15}{20}$, $\frac{16}{20}$, $\frac{18}{24}$

25. Write 8 fractions reduced to lowest terms. Then write 8 fractions not reduced to lowest terms.

Do you have difficulty in changing numbers such as $5\frac{6}{4}$ to the simplest form? Practice changing the following:

26. $5\frac{4}{3}$
27. $6\frac{3}{2}$
28. $7\frac{6}{4}$
29. $5\frac{10}{8}$
30. $4\frac{2}{2}$
31. $3\frac{3}{3}$
32. $8\frac{4}{2}$
33. $6\frac{6}{3}$
34. $9\frac{11}{8}$
35. $7\frac{5}{3}$

PRACTICE WITH FRACTIONS

Find the answers to the following examples:

	a	*b*	*c*	*d*	*e*	*f*
1.	$\frac{1}{4}$ $+\frac{1}{4}$	$\frac{3}{4}$ $-\frac{1}{4}$	$1\frac{1}{3}$ $+2\frac{1}{3}$	$\frac{2}{3}$ $-\frac{1}{3}$	$6\frac{1}{2}$ $+5\frac{1}{2}$	$\frac{5}{8}$ $-\frac{5}{8}$
2.	$3\frac{1}{2}$ -2	$7\frac{3}{4}$ $+5\frac{1}{4}$	$5\frac{3}{4}$ $-2\frac{1}{4}$	$6\frac{5}{6}$ $+7\frac{5}{6}$	$3\frac{3}{4}$ $-2\frac{3}{4}$	9 $+7\frac{1}{2}$
3.	$6\frac{3}{4}$ $+5\frac{3}{4}$	$7\frac{3}{4}$ $-\frac{1}{4}$	$8\frac{5}{8}$ $+4\frac{7}{8}$	$7\frac{1}{2}$ $-5\frac{1}{2}$	$6\frac{2}{3}$ $+\frac{2}{3}$	$8\frac{5}{8}$ $-\frac{2}{8}$

QUESTIONS ABOUT ADDING FRACTIONS

Study the work on this page carefully before you work the examples on page 173.

1. $3\frac{1}{4}$ — What do we call numbers like $3\frac{1}{4}$?
   $+2\frac{1}{4}$ — How do we get $5\frac{2}{4}$?
   $5\frac{2}{4} = 5\frac{1}{2}$ — How do we change $5\frac{2}{4}$ to $5\frac{1}{2}$?
2. Why do you reduce $5\frac{2}{4}$?
3. $2\frac{1}{2}$ — What is a fraction like $\frac{2}{2}$ called?
   $+4\frac{1}{2}$ — How do we change $\frac{2}{2}$ to 1?
   $6\frac{2}{2} = 6 + 1 = 7$ — Show that $6\frac{2}{2}$ is the same as $6 + 1$.
4. Give another pair of fractions whose sum is equal to 1.
5. $5\frac{2}{3}$ — What is the sum of $\frac{2}{3} + \frac{2}{3}$?
   $+3\frac{2}{3}$ — How do we change $\frac{4}{3}$ to $1\frac{1}{3}$?
   $8\frac{4}{3} = 8 + 1\frac{1}{3} = 9\frac{1}{3}$ — Why must we change $\frac{4}{3}$ to $1\frac{1}{3}$?
6. Express the number $8\frac{3}{2}$ in its simplest form.
7. $3\frac{3}{4}$ — How do we get $9\frac{6}{4}$?
   $+6\frac{3}{4}$ — How do we get $9 + 1\frac{2}{4}$?
   $9\frac{6}{4} = 9 + 1\frac{2}{4} =$ — How do we get the $10\frac{2}{4}$?
   $10\frac{2}{4} = 10\frac{1}{2}$ — Why must we change $10\frac{2}{4}$ to $10\frac{1}{2}$?
8. Express the number $7\frac{12}{8}$ in its simplest form.
9. Complete these examples by finding the missing numbers:

a. $\frac{1}{3}$ $+\frac{1}{3}$ $\frac{?}{3}$ *b.* $5\frac{1}{4}$ $+6\frac{2}{4}$ $?\frac{?}{4}$ *c.* $7\frac{3}{4}$ $+4\frac{3}{4}$ $?\frac{?}{4} = ?$ *d.* $5\frac{1}{2}$ $+2\frac{1}{2}$ $?\frac{?}{2} = ?$

THINGS TO REMEMBER

1. In adding fractions be sure that you add correctly.
2. Always express your answer in simplest form. Thus: change $3\frac{2}{2}$ to 4.
3. Be sure that fractions in the answers are expressed in lowest terms. Thus, change $3\frac{4}{8}$ to $3\frac{1}{2}$.

CORRECTING ERRORS IN ADDITION OF FRACTIONS

The examples below contain the kinds of errors that boys and girls most often make in addition of fractions. Study each example to find the error in it. Then copy and work the example correctly. Do you ever make these errors?

1. $5\frac{1}{4}$ + $6\frac{1}{4}$ = $11\frac{2}{4}$

2. $7\frac{2}{3}$ + $5\frac{2}{3}$ = $12\frac{4}{3}$

3. $9\frac{7}{8}$ + $6\frac{4}{8}$ = $15\frac{11}{8} = 15 + 1\frac{4}{8} = 16\frac{1}{2}$

4. $\frac{7}{12}$ + $\frac{1}{12}$ = $\frac{8}{12} = \frac{3}{4}$

5. $8\frac{1}{3}$ + $9\frac{2}{3}$ = $17\frac{3}{3} = 1$

6. $8\frac{5}{6}$ + $7\frac{4}{6}$ = $14\frac{9}{6} = 14 + 1\frac{2}{6} = 15\frac{2}{6}$

PRACTICE IN ADDITION OF FRACTIONS

These examples contain all of the kinds of addition examples you have studied. How many of them can you work correctly? If necessary, you may turn back to the pages you have studied for help.

Set I

	a	*b*	*c*	*d*	*e*	*f*	*g*
1.	$\frac{1}{4}$ + $\frac{1}{4}$	$\frac{1}{5}$ + $\frac{1}{5}$	$2\frac{1}{3}$ + $3\frac{1}{3}$	$6\frac{1}{8}$ + $7\frac{3}{8}$	$3\frac{1}{3}$ + 2	$\frac{3}{5}$ + 3	$3\frac{1}{6}$ + $4\frac{3}{6}$
2.	$\frac{3}{4}$ + $\frac{3}{4}$	$\frac{1}{2}$ + $\frac{1}{2}$	$\frac{2}{3}$ + $\frac{2}{3}$	$5\frac{3}{4}$ + $2\frac{1}{4}$	$6\frac{3}{5}$ + $7\frac{4}{5}$	$8\frac{7}{8}$ + $\frac{1}{8}$	$9\frac{5}{8}$ + $6\frac{7}{8}$

Set II

1.	$\frac{3}{8}$ + $\frac{1}{8}$	$\frac{2}{5}$ + $\frac{2}{5}$	$3\frac{5}{8}$ + $2\frac{1}{8}$	$8\frac{1}{3}$ + $\frac{1}{3}$	5 + $7\frac{1}{2}$	$3\frac{1}{6}$ + $4\frac{1}{6}$	$\frac{4}{5}$ + $\frac{4}{5}$
2.	$5\frac{1}{2}$ + $4\frac{1}{2}$	$\frac{7}{8}$ + $\frac{3}{8}$	$6\frac{2}{3}$ + $4\frac{2}{3}$	$3\frac{3}{4}$ + $2\frac{3}{4}$	$8\frac{1}{4}$ + $\frac{3}{4}$	$\frac{3}{5}$ + $7\frac{4}{5}$	$4\frac{5}{6}$ + $9\frac{5}{6}$

*MAGIC SQUARES

1. In a magic square the sums of the numbers in each row and column are the same. The sums of the numbers on the diagonals (lines through opposite corners) of the square are the same also. See if the square at the right is a magic square.

A

2	$7\frac{1}{2}$	7	$\frac{1}{2}$
$4\frac{1}{2}$	3	$3\frac{1}{2}$	6
$2\frac{1}{2}$	5	$5\frac{1}{2}$	4
8	$1\frac{1}{2}$	1	$6\frac{1}{2}$

2. See if each of the squares below is a magic square.

B

$1\frac{1}{3}$	5	$4\frac{2}{3}$	$\frac{1}{3}$
3	2	$2\frac{1}{3}$	4
$1\frac{2}{3}$	$3\frac{1}{3}$	$3\frac{2}{3}$	$2\frac{2}{3}$
$5\frac{1}{3}$	1	$\frac{2}{3}$	$4\frac{1}{3}$

C

$\frac{4}{5}$	$1\frac{4}{5}$	1	$3\frac{1}{5}$
3	$1\frac{1}{5}$	2	$\frac{2}{5}$
$2\frac{4}{5}$	$1\frac{2}{5}$	$2\frac{1}{5}$	$\frac{2}{5}$
$\frac{1}{5}$	$2\frac{2}{5}$	$1\frac{3}{5}$	$2\frac{3}{5}$

3. On your paper draw a square containing 16 blocks or cells like one of the magic squares above. Now take the numbers in magic square A and to each number add $\frac{1}{2}$. Write the numbers in the cells in your square. When you have completed this addition, add your numbers to see if your square is a magic square.

4. Draw another 16-cell square on your paper. Now take the numbers in magic square B. Add $\frac{2}{3}$ to each number and write it in your square. See if the square you get in this way is still a magic square.

5. If you have a magic square, tell a way in which you can get a magic square containing different numbers.

6. Make two magic squares, using the numbers in magic square C. To get one magic square add some fraction to each of the numbers. To get the other magic square add some mixed number to each of the numbers.

"YES" OR "NO" QUESTIONS

Number ten lines on your paper. Read a statement below. Then decide whether the answer is **yes** or **no.** After the number of the statement write your answer. Be ready to show why your answer is correct.

1. Are there eight pints in a gallon?
2. Is ten inches more than a foot?
3. Are apples cheaper when sold by the piece than when sold by the box?
4. Are there about 52 weeks in a year?
5. Is two pounds more than 30 ounces?
6. Is the product of two whole numbers always greater than either of the numbers?
7. When a whole number is divided by a whole number, is the quotient less than either of the numbers?
8. Does a larger denominator make a fraction of smaller value?
9. Can a boy or girl walk a mile in 5 minutes?
10. Can airplanes fly 300 miles in an hour?

LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$\frac{3}{4} - \frac{1}{4}$	28×60	$2\frac{1}{2} - 1\frac{1}{2}$	$6\frac{1}{4} + 5\frac{1}{4}$	$65\overline{)472}$
2.	$9\frac{3}{4} + 7\frac{3}{4}$	$86\overline{)522}$	$\$3.97 \times 58$	$4\frac{2}{3} - 3$	$\frac{1}{8}$ of 200 =
3.	$94\overline{)782}$	$6\frac{7}{8} - 6\frac{3}{8}$	$6\frac{1}{2} + 9\frac{1}{2}$	$35\overline{)179}$	$7\frac{2}{3} + 8\frac{2}{3}$

4. $\$87.64 + \$79.87 + \$.65 + \$3.04 =$

DIAGNOSTIC TEST IN ADDITION OF LIKE FRACTIONS

This test will help you to find out if you need more practice on any of the kinds of examples that it contains.

	a	*b*	*c*	*d*	*e*	*f*	
1.	$\frac{2}{3}$ $\frac{2}{3}$	$\frac{3}{5}$ $\frac{4}{5}$	$\frac{7}{8}$ $\frac{4}{8}$	$\frac{3}{4}$ $\frac{2}{4}$	$\frac{5}{6}$ $\frac{2}{6}$	$\frac{3}{10}$ $\frac{8}{10}$	(164)
2.	$\frac{1}{2}$ $\frac{1}{2}$	$\frac{3}{5}$ $\frac{2}{5}$	$\frac{1}{8}$ $\frac{7}{8}$	$\frac{1}{4}$ $\frac{3}{4}$	$\frac{5}{6}$ $\frac{1}{6}$	$\frac{2}{3}$ $\frac{1}{3}$	(165)
3.	$\frac{3}{4}$ $\frac{3}{4}$	$\frac{5}{8}$ $\frac{7}{8}$	$\frac{7}{8}$ $\frac{7}{8}$	$\frac{7}{10}$ $\frac{5}{10}$	$\frac{7}{8}$ $\frac{3}{8}$	$\frac{5}{6}$ $\frac{5}{6}$	(165)
4.	$2\frac{1}{3}$ $3\frac{2}{3}$	$4\frac{1}{4}$ $2\frac{3}{4}$	$3\frac{1}{6}$ $2\frac{5}{6}$	$7\frac{1}{2}$ $\frac{1}{2}$	$\frac{1}{8}$ $3\frac{7}{8}$	$8\frac{3}{5}$ $5\frac{2}{5}$	(168)
5.	$4\frac{7}{8}$ $3\frac{5}{8}$	$4\frac{2}{3}$ $\frac{2}{3}$	$9\frac{5}{6}$ $7\frac{5}{6}$	$6\frac{3}{4}$ $\frac{3}{4}$	$5\frac{3}{4}$ $8\frac{2}{4}$	$\frac{4}{5}$ $6\frac{3}{5}$	(168)

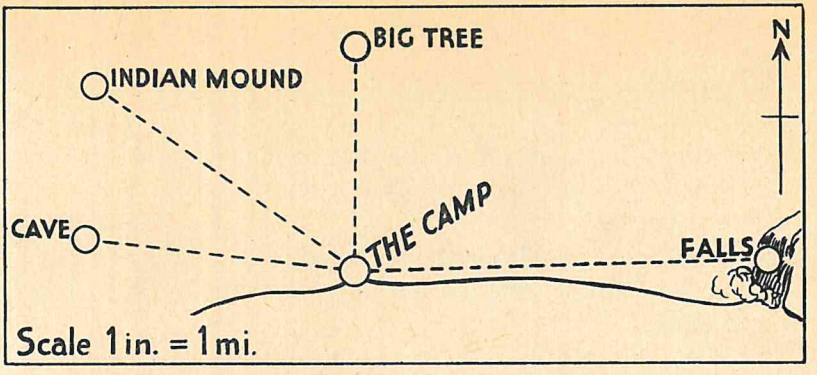
If you have errors in only one or two examples in a row, correct your work at once. If you have three or more errors, turn back to the pages indicated at the end of the row for help. Then rework the examples that were not correct.

Repeat the diagnostic test on page 108. Do not be satisfied until you can work all of the examples in both diagnostic tests quickly and easily.

*INTERESTING THINGS TO FIND OUT

If you do not need further practice, choose one of the following topics and prepare a report on it to tell your class.

1. A list of things weighing an ounce each.
2. Fractions used by boys and girls.
3. Newspaper clippings containing fractions.
4. Uses of fractions in other books.



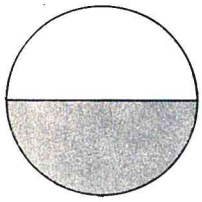
THE MAP OF A BOY SCOUT CAMP

This is a map of a boy scout camp. It shows some of the interesting places near the camp. On the map a distance of 1 inch stands for 1 mile. If you measure the dotted lines on the map, you can find how far these places are from the camp. We say that the map is drawn to the scale, 1 in. = 1 mi.

1. Measure with your ruler the distance on the map from the edge of the camp to the big tree. The distance on the map is (?) inch. How many miles does this distance on the map stand for?
2. Find how many miles it is from the camp to the cave.
3. How far is it from the camp to the Indian Mound?
4. How far from the camp are the Falls?
5. Which is farther from the camp, the Falls or the Indian Mound? How much farther?
6. With your ruler measure the distance in a straight line from the Indian Mound to the Falls. How many miles is it from the Indian Mound to the Falls?
7. Make a neat copy of this map on your paper. Measure the distance on the map carefully.

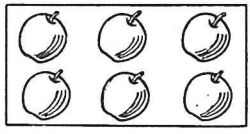
*8. To your map add a ball field that is $\frac{1}{2}$ mile northeast of the camp. Use a small square to show the ball field on your map.

DIFFERENT MEANINGS OF FRACTIONS



You have learned about the different uses of fractions. The problems below review these different uses.

1. What part of this circle is colored (shaded)? Here a fraction is used to name a part of one whole thing.



2. How do you find $\frac{1}{2}$ of the number of apples shown in the box at the right?

Here the fraction, $\frac{1}{2}$, tells about a part of a group of things. To find $\frac{1}{2}$ of a group of 6 apples, divide 6 by 2. One half of $6 = 6 \div 2$.

3. What part of an hour (60 minutes) is 30 minutes?

Here we compare 30 and 60. One minute is $\frac{1}{60}$ of an hour; so 30 minutes is $\frac{30}{60}$ hours or $\frac{1}{2}$ hour.

4. In the same way as we compared parts of an hour, we compare the heights of 2 trees at the right. Would you say that the little tree was $\frac{1}{2}$, $\frac{1}{4}$, or $\frac{3}{4}$ as tall as the large tree? How can you prove your answer?

5. Mary cut a ribbon 3 yards long into 4 equal pieces. How long was each piece? Think: 3 yd. $\div$ 4 $=$ $\frac{3}{4}$ yd. Here the fraction, $\frac{3}{4}$, means that 3 has been divided by 4. If a ribbon 5 yards long is divided into 4 equal pieces, each piece is $1\frac{1}{4}$ yd. long.

$$4\overline{)\,5}\quad 1\tfrac{1}{4}$$

6. Which of these four uses of fractions does each problem below show?

a. How many cookies are there in $\frac{1}{2}$ dozen?

b. Ann has $\frac{1}{4}$ of a pie. Make a picture showing the part of the pie that Ann has.

c. John's father drove 4 miles in 10 minutes. At this rate how long did it take him to drive one mile?

WHICH COW SHOULD THE FARMER KEEP?

A group of 4-H Club boys was studying the raising of cows. In some records kept by a farmer, Tom found the facts given below about two cows.

	Milk Produced	Butter-fat	Value of Product	Cost of Feed	Total Cost
Molly	1,340 lb.	57 lb.	$36	$40	$89
Betty	13,605 lb.	599 lb.	$410	$109	$242

1. How much milk did Molly produce? How much more milk did Betty produce than Molly?

2. How much butterfat did Molly produce? How much more than this did Betty produce? For what is butterfat used?

3. What was the value of the milk and butterfat produced by Molly? by Betty? How much less was the value of the product produced by Molly than the value of the product produced by Betty?

4. For which cow did the feed cost more? How much more? What foods do cows eat?

5. For which cow was the "total cost" more? How much more? What items do you think "total cost" would include?

6. Which was more for Molly, the value of the product or the total cost? How much more?

7. Which was more for Betty, the value of the product or the total cost? How much more?

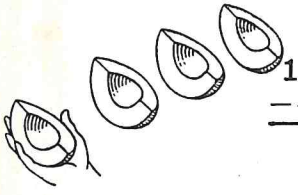
*8. Should a farmer keep a cow like Molly? Why?

*9. Should a farmer keep a cow like Betty? Why?

*10. Find out if cows ever produce more milk a year than Betty did. Do they ever produce more butterfat? Find out the names of our great milk-producing states.

SUBTRACTING FRACTIONS FROM ONE

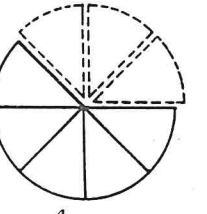
1. George cut a melon into four equal parts. He ate one of the parts. What part of the melon did he have left?



$$\begin{array}{rl} 1 & = \frac{4}{4} \\ -\frac{1}{4} & = \frac{1}{4} \\ \hline & \frac{3}{4} \end{array}$$

THINK: 1 melon $-$ $\frac{1}{4}$ melon $=$?
You can see that 1 melon $=$ $\frac{4}{4}$ melon.
So change the 1 to $\frac{4}{4}$ as shown at the left.
Then subtract: $\frac{4}{4} - \frac{1}{4} = \frac{3}{4}$.
George had $\frac{3}{4}$ melon left.

2. Use the picture at the right to show that $1 - \frac{3}{8} = \frac{8}{8} - \frac{3}{8} = \frac{5}{8}$.



3. Draw a picture showing that $1 - \frac{3}{4} = \frac{1}{4}$.

4. Study the following examples carefully and show that the work is correct.

a. $\begin{array}{rl} 1 & = \frac{2}{2} \\ -\frac{1}{2} & = \frac{1}{2} \\ \hline & \frac{1}{2} \end{array}$ *b.* $\begin{array}{rl} 1 & = \frac{3}{3} \\ -\frac{2}{3} & = \frac{2}{3} \\ \hline & \frac{1}{3} \end{array}$ *c.* $\begin{array}{rl} 1 & = \frac{4}{4} \\ -\frac{3}{4} & = \frac{3}{4} \\ \hline & \frac{1}{4} \end{array}$

5. Copy and work the examples in 4 with your book closed.

6. June had a piece of cloth 1 yard long. She cut off a piece $\frac{3}{4}$ yard long. How long was the piece that was left?

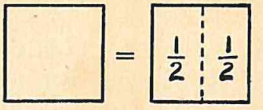
Subtract:

	a	*b*	*c*	*d*
7.	$1 - \frac{1}{3} =$	$1 - \frac{4}{5} =$	$1 - \frac{1}{6} =$	$1 - \frac{1}{8} =$
8.	$1 - \frac{2}{5} =$	$1 - \frac{3}{8} =$	$1 - \frac{7}{10} =$	$1 - \frac{5}{6} =$

LET'S PRACTICE

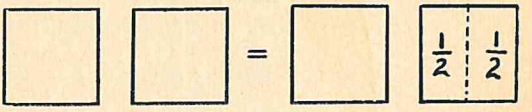
1.	$2\frac{1}{4} + 1\frac{1}{4} =$	4.	$\frac{3}{4} + \frac{1}{4} =$	7.	$2\frac{1}{4} - 2 =$	10.	$1 - \frac{1}{4} =$
2.	$1 - \frac{1}{2} =$	5.	$5\frac{1}{2} - \frac{1}{2} =$	8.	$5\frac{3}{4} - 2\frac{1}{4} =$	11.	$7\frac{2}{3} + 8\frac{2}{3} =$
3.	$\frac{7}{8} - \frac{3}{8} =$	6.	$7\frac{3}{8} + 4\frac{7}{8} =$	9.	$1 - \frac{5}{8} =$	12.	$8\frac{1}{2} + 2\frac{1}{2} =$

PICTURING FRACTIONS AND WHOLE NUMBERS



1. The squares at the right show that $1 = \frac{2}{2}$. Draw squares to show that $1 = \frac{4}{4}$.

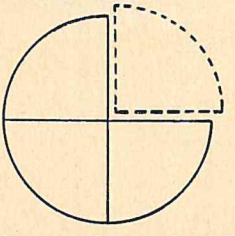
2. The squares at the right show that $2 = 1\frac{2}{2}$. Draw squares to show that $2 = 1\frac{4}{4}$.



3. Draw squares to show that
   a. $2 = 1\frac{3}{3}$ *b.* $3 = 2\frac{2}{2}$ *c.* $4 = 3\frac{4}{4}$.
4. Draw circles and divide them to show that
   a. $1 = \frac{3}{3}$ *b.* $1 = \frac{2}{2}$ *c.* $2 = 1\frac{4}{4}$ *d.* $3 = 2\frac{8}{8}$
5. Use your ruler to prove that 2 inches equals $1\frac{2}{2}$ inches.
6. Draw a four-inch line on your paper. Use this line to show that $4 = 3\frac{4}{4}$.
7. Use any way you choose to show that $3 = 2\frac{2}{2}$.
8. $1 = \frac{?}{8}$ 10. $2 = 1\frac{?}{2}$ 12. $2 = 1\frac{?}{8}$ 14. $4 = ?\frac{2}{2}$
9. $1 = \frac{?}{4}$ 11. $2 = 1\frac{?}{4}$ 13. $3 = 2\frac{?}{4}$ 15. $5 = ?\frac{4}{4}$

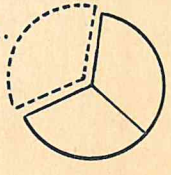
LET'S TELL THE STORIES

The drawing at the right tells the four stories below. Explain.

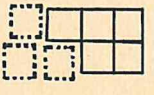


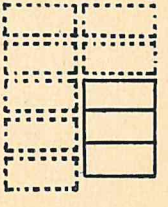
a. $\begin{array}{r} \frac{1}{4} \\ +\frac{3}{4} \\ \hline 1 \end{array}$ *b.* $\begin{array}{r} \frac{3}{4} \\ +\frac{1}{4} \\ \hline 1 \end{array}$ *c.* $\begin{array}{r} 1 \\ -\frac{1}{4} \\ \hline \frac{3}{4} \end{array}$ *d.* $\begin{array}{r} 1 \\ -\frac{3}{4} \\ \hline \frac{1}{4} \end{array}$

What are the four stories told by each of the drawings below?

1. 

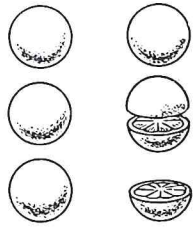
2.

3. 

4. 

SUBTRACTING FRACTIONS FROM WHOLE NUMBERS

1. **A.** Paul had 2 oranges.
   B. He cut one orange into halves.
   C. He ate one of the halves.
   How many oranges remained?

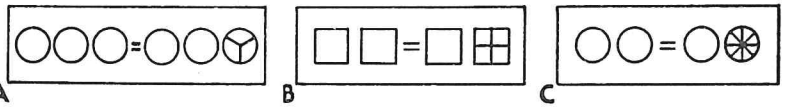


To work this example $2 - \frac{1}{2}$:

$$\begin{array}{rl} 2 & = 1\frac{2}{2} \\ -\frac{1}{2} & = \frac{1}{2} \\ \hline & 1\frac{1}{2} \end{array}$$

You can see that 2 oranges is the same as 1 orange + $\frac{2}{2}$ oranges. Change 2 to $1\frac{2}{2}$.
Subtract the fractions: $\frac{2}{2} - \frac{1}{2} = \frac{1}{2}$
Subtract the whole numbers: $1 - 0 = 1$
Paul had $1\frac{1}{2}$ oranges left.

2. Which of the pictures below shows that $2 = 1\frac{4}{4}$?



3. Which picture shows that $2 = 1\frac{8}{8}$?
4. Which picture shows that $3 = 2\frac{3}{3}$?
5. Show that the work in the examples below is correct.

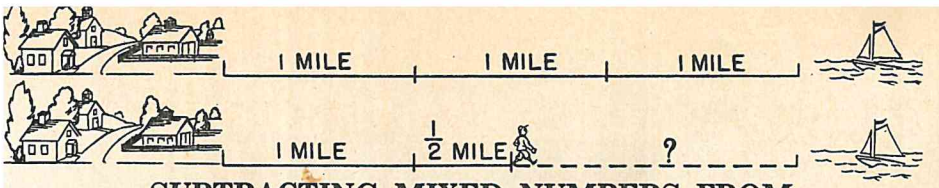
a.
$$\begin{array}{rl} 2 & = 1\frac{4}{4} \\ -\frac{1}{4} & = \frac{1}{4} \\ \hline & 1\frac{3}{4} \end{array}$$

b.
$$\begin{array}{rl} 4 & = 3\frac{3}{3} \\ -\frac{1}{3} & = \frac{1}{3} \\ \hline & 3\frac{2}{3} \end{array}$$

c.
$$\begin{array}{rl} 4 & = 3\frac{8}{8} \\ -\frac{3}{8} & = \frac{3}{8} \\ \hline & 3\frac{5}{8} \end{array}$$

Subtract:

	a	*b*	*c*	*d*	*e*	*f*	*g*
6.	$2 - \frac{1}{2}$	$2 - \frac{3}{5}$	$2 - \frac{3}{4}$	$2 - \frac{1}{8}$	$2 - \frac{5}{6}$	$2 - \frac{1}{10}$	$6 - \frac{1}{4}$
7.	$3 - \frac{1}{2}$	$4 - \frac{4}{5}$	$5 - \frac{1}{4}$	$6 - \frac{5}{8}$	$4 - \frac{1}{6}$	$7 - \frac{7}{10}$	$1 - \frac{3}{4}$
8.	$5\frac{1}{2} - 3$	$1 - \frac{3}{4}$	$5\frac{3}{4} - 2\frac{1}{4}$	$8\frac{2}{3} - 5\frac{2}{3}$	$7 - 2\frac{3}{4}$	$\frac{1}{3} - \frac{1}{3}$	$6 - \frac{2}{3}$



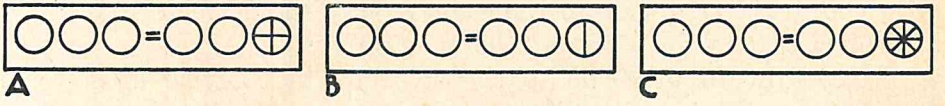
SUBTRACTING MIXED NUMBERS FROM WHOLE NUMBERS

1. From picture A above, how far is it from James' home to the lake? James rode $1\frac{1}{2}$ miles toward the lake and walked the remaining distance. How far did he walk? (See picture B.)

$$\begin{array}{r} 3 \\ -1\frac{1}{2} \\ \hline \end{array} = \begin{array}{r} 2\frac{2}{2} \\ 1\frac{1}{2} \\ \hline 1\frac{1}{2} \end{array}$$

THINK: 3 mi. $-$ $1\frac{1}{2}$ mi. $=$?
Think of 3 mi. as 2 mi. $+$ 1 mi., or $2\frac{2}{2}$ mi.
Change 3 to $2\frac{2}{2}$. Then subtract.
He walked $1\frac{1}{2}$ mi.

2. Which of the pictures below shows that $3 = 2\frac{2}{2}$?



3. Which picture shows that $3 = 2\frac{4}{4}$? that $3 = 2\frac{8}{8}$?

4. Study these examples. Copy and work them.

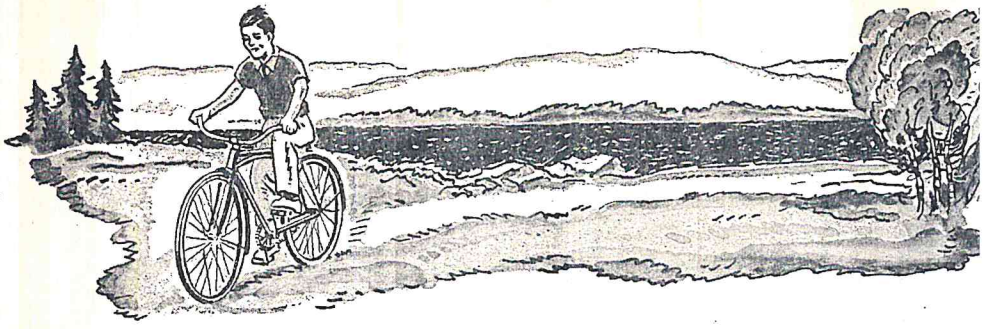
$$\begin{array}{rr} a. & 4 \\ & -2\frac{1}{4} \\ \hline & 1\frac{3}{4} \end{array} = \begin{array}{r} 3\frac{4}{4} \\ 2\frac{1}{4} \\ \hline \end{array} \qquad \begin{array}{rr} b. & 4 \\ & -\frac{1}{3} \\ \hline & 3\frac{2}{3} \end{array} = \begin{array}{r} 3\frac{3}{3} \\ \frac{1}{3} \\ \hline \end{array} \qquad \begin{array}{rr} c. & 7 \\ & -6\frac{3}{8} \\ \hline & \frac{5}{8} \end{array} = \begin{array}{r} 6\frac{8}{8} \\ 6\frac{3}{8} \\ \hline \end{array}$$

5. To what number must you change each number below if you wish to subtract $1\frac{3}{8}$ from it? $2\frac{1}{2}$? $1\frac{1}{4}$? $2\frac{3}{4}$?

3 5 9 7 4 12

Subtract:

	a	*b*	*c*	*d*	*e*	*f*	*g*
6.	3	7	5	4	6	7	6
	$1\frac{3}{8}$	$2\frac{1}{2}$	$2\frac{3}{8}$	$3\frac{1}{2}$	$\frac{2}{3}$	$6\frac{5}{8}$	$3\frac{1}{3}$
7.	9	12	8	3	9	8	4
	$7\frac{1}{4}$	$2\frac{1}{2}$	$\frac{3}{4}$	$2\frac{7}{8}$	$1\frac{5}{8}$	$7\frac{1}{2}$	$\frac{1}{3}$



USING A BICYCLE

1. Edward often rides to the lake to swim. It is $1\frac{1}{4}$ miles from his house to the lake. How far does Edward ride in going from his house to the lake and back again?

2. It is $\frac{3}{4}$ mile from Edward's house to the grocery store. Today Edward rode to the store to buy some bread. How far was it to the store and back again?

3. Edward can ride to the store on his bicycle in $3\frac{1}{2}$ minutes. If he walks, it takes him 15 minutes. How much time does he save if he uses his bicycle?

4. Edward and Alice had a race to see who could ride around the block in the shorter time. It took Edward $1\frac{1}{4}$ minutes and Alice $1\frac{3}{4}$ minutes. How much longer than it took Edward did it take Alice?

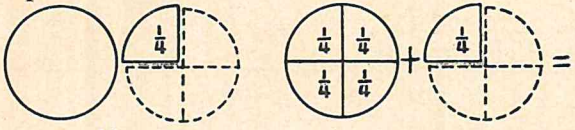
5. One day Edward bought a new tire for $1.20 and a new lamp for $.85. He also paid the man at the bicycle shop $.75 for repairing the frame. How much was the total cost?

*6. The distance around the outside of a bicycle tire is a little more than 3 times the diameter or distance through the middle of the tire. Show that this rule is correct by measuring the wheel of some bicycle. Explain clearly how to find the distance a bicycle goes each time that the wheel goes around. Try your method with some bicycle.

*7. What is a cyclometer? Why do bicycles have "serial numbers"?

PICTURING MIXED NUMBERS

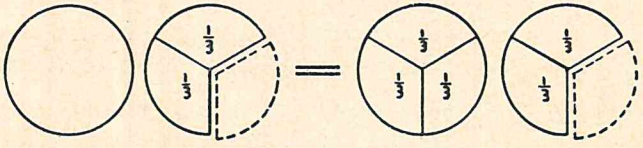
1. The drawings below show that $1\frac{1}{4}$ circles equal $\frac{5}{4}$ circles. Explain the work.



$1\frac{1}{4}$ $\frac{4}{4}$ + $\frac{1}{4}$ = $\frac{5}{4}$

2. Show by reduction that $\frac{5}{4} = 1\frac{1}{4}$.

3. Use the drawing below to show that $1\frac{2}{3} = \frac{5}{3}$.



4. Show by reduction that $\frac{5}{3} = 1\frac{2}{3}$.

5. Use your ruler to show that $1\frac{3}{4}$ inches $= \frac{7}{4}$ inches.

6. Use drawings to show how many quarter apples there are in $1\frac{3}{4}$ apples; in $1\frac{1}{4}$ apples.

7. Show by reduction that $\frac{7}{4} = 1\frac{3}{4}$; that $\frac{5}{4} = 1\frac{1}{4}$.

8. Use circles to show how many eighths there are in $1\frac{1}{8}$; in $1\frac{3}{8}$; in $1\frac{5}{8}$; in $1\frac{7}{8}$.

9. Draw a line $1\frac{3}{8}$ inches long. Divide it into eighths of an inch. How many eighths are there in $1\frac{3}{8}$ inches?

10. Show by reduction that $\frac{11}{8} = 1\frac{3}{8}$.

Give the missing numerators:

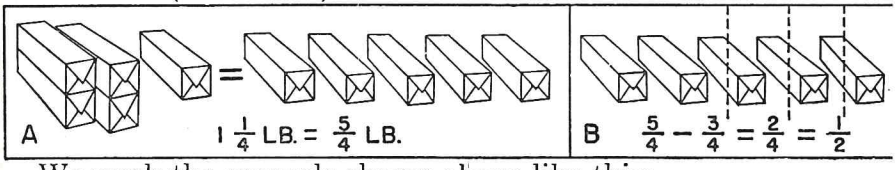
	a	*b*	*c*	*d*	*e*
11.	$1\frac{1}{2} = \frac{\quad}{2}$	$1\frac{1}{4} = \frac{\quad}{4}$	$1\frac{5}{8} = \frac{\quad}{8}$	$1\frac{2}{3} = \frac{\quad}{3}$	$1\frac{1}{10} = \frac{\quad}{10}$
12.	$1\frac{1}{8} = \frac{\quad}{8}$	$1\frac{1}{6} = \frac{\quad}{6}$	$1\frac{3}{4} = \frac{\quad}{4}$	$1\frac{7}{8} = \frac{\quad}{8}$	$1\frac{5}{6} = \frac{\quad}{6}$

13. Show that $1\frac{3}{8}$ and $\frac{11}{8}$ have the same value.

14. Show that $1\frac{5}{6}$ and $\frac{11}{6}$ have the same value.

SUBTRACTING A FRACTION FROM A MIXED NUMBER

1. Mrs. Jones had $1\frac{1}{4}$ pounds of butter. (Picture A.) She used $\frac{3}{4}$ pound for cooking. How much butter did she then have? (Picture B.)



We work the example shown above like this:

$$1\tfrac{1}{4} = \tfrac{5}{4}$$
$$-\tfrac{3}{4} = \tfrac{3}{4}$$
$$\tfrac{2}{4} = \tfrac{1}{2}$$

You cannot subtract $\frac{3}{4}$ from $\frac{1}{4}$ because $\frac{3}{4}$ is larger than $\frac{1}{4}$. Change $1\frac{1}{4}$ to $\frac{5}{4}$. Subtract.

How do we get the $\frac{2}{4}$? the $\frac{1}{2}$? She had $\frac{1}{2}$ pound butter left.

2. Study the following examples carefully. Then copy and work them with your book closed.

a. $1\frac{1}{3} = \frac{4}{3}$, $-\frac{2}{3} = \frac{2}{3}$, $\frac{2}{3}$

b. $1\frac{1}{8} = \frac{9}{8}$, $-\frac{3}{8} = \frac{3}{8}$, $\frac{6}{8} = \frac{3}{4}$

c. $1\frac{3}{8} = \frac{11}{8}$, $-\frac{7}{8} = \frac{7}{8}$, $\frac{4}{8} = \frac{1}{2}$

Supply the missing numerators and subtract:

3. $1\frac{5}{8} = \frac{?}{8}$, $-\frac{7}{8} = \frac{7}{8}$

4. $1\frac{1}{6} = \frac{?}{6}$, $-\frac{5}{6} = \frac{5}{6}$

5. $1\frac{2}{5} = \frac{?}{5}$, $-\frac{3}{5} = \frac{3}{5}$

	a	*b*	*c*	*d*	*e*	*f*
6.	$1\frac{1}{8}$, $-\frac{7}{8}$	$1\frac{1}{4}$, $-\frac{2}{4}$	$1\frac{1}{5}$, $-\frac{2}{5}$	$1\frac{1}{8}$, $-\frac{5}{8}$	$1\frac{3}{10}$, $-\frac{7}{10}$	$1\frac{4}{8}$, $-\frac{5}{8}$
7.	$1\frac{1}{10}$, $-\frac{5}{10}$	$1\frac{2}{5}$, $-\frac{4}{5}$	$1\frac{3}{8}$, $-\frac{7}{8}$	$1\frac{5}{8}$, $-\frac{7}{8}$	$1\frac{2}{6}$, $-\frac{5}{6}$	$1\frac{5}{8}$, $-\frac{6}{8}$
8.	$7\frac{1}{2}$, $+5\frac{1}{2}$	$1\frac{3}{8}$, $-\frac{5}{8}$	$9\frac{1}{3}$, $+8\frac{1}{3}$	$8\frac{1}{2}$, -5	$6\frac{3}{4}$, $+5\frac{3}{4}$	$8\frac{1}{4}$, $+5\frac{1}{4}$

THE SCHOOL HAS A FAIR

1. Janet had $1\frac{1}{4}$ pounds of fudge to sell. She sold $\frac{3}{4}$ pound of it to one man. How much fudge did she then have?

2. Alice made 4 pounds of candy to sell. She sold the candy in $\frac{1}{2}$-pound bags. How many bags would 1 pound of candy make? How many bags would 4 pounds of candy make?

3. John sold tickets for the fish-pond game at 10 cents each. He sold 48 tickets. How much did he receive in all for the tickets that he sold?

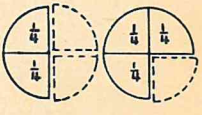
4. George sold 14 dozen bottles of gingerale at 5 cents a bottle. How much was received from the gingerale he sold?

5. Jane made 4 aprons to sell at the fair. The cloth for the aprons cost $1.20 and the thread 10 cents. The aprons were sold for $.30 each. How much less was received for all of the aprons than Jane spent for the materials?

LET'S TELL THE STORIES

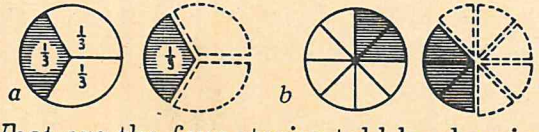
Use the drawing at the right to explain the four examples below:

a. $\frac{2}{4} + \frac{3}{4} = \frac{5}{4} = 1\frac{1}{4}$ *b.* $\frac{3}{4} + \frac{2}{4} = \frac{5}{4} = 1\frac{1}{4}$ *c.* $1\frac{1}{4} - \frac{3}{4} = \frac{2}{4} = \frac{1}{2}$ *d.* $1\frac{1}{4} - \frac{2}{4} = \frac{3}{4}$



1. Which of the drawings below prove the examples?

$1\frac{1}{3} - \frac{2}{3} = \frac{2}{3}$? $1\frac{3}{8} - \frac{5}{8} = \frac{6}{8} = \frac{3}{4}$?

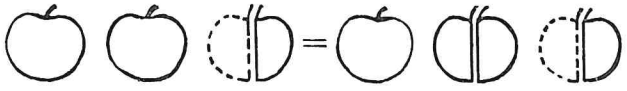


2. What are the four stories told by drawing *a*? by *b*?

3. Make a picture to show that $1\frac{1}{8} - \frac{3}{8} = \frac{6}{8} = \frac{3}{4}$.

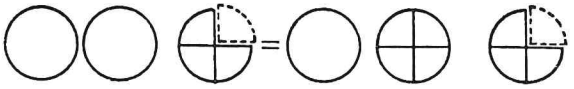
PICTURING LARGER MIXED NUMBERS

1. Use the pictures of apples below to show that $2\frac{1}{2}$ apples equals one apple and three half apples, or $1\frac{3}{2}$ apples.



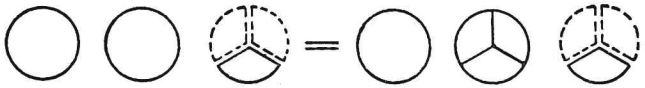
$1 + 1 + \frac{1}{2} = 1 + \frac{2}{2} + \frac{1}{2} = 1\frac{3}{2}$

2. Use the circles below to show that $2\frac{3}{4}$ equals $1\frac{7}{4}$.



$2 + \frac{3}{4} = 1 + \frac{4}{4} + \frac{3}{4} = 1\frac{7}{4}$

3. Use the circles below to show that $2\frac{1}{3}$ equals $1\frac{4}{3}$.



4. Draw circles to show that $3\frac{1}{2} = 2\frac{3}{2}$; that $3\frac{3}{4} = 2\frac{7}{4}$.

5. Use your ruler to show that $4\frac{1}{4}$ inches is the same as 3 inches plus $\frac{4}{4}$ inch plus $\frac{1}{4}$ inch, or $3\frac{5}{4}$ inches.

6. Draw a line $2\frac{1}{4}$ inches long. From one end mark off five quarter-inch lengths. Show that $2\frac{1}{4}$ inches equals $1\frac{5}{4}$ inches.

7. Change the form of $1\frac{5}{4}$ to show that $1\frac{5}{4}$ equals $2\frac{1}{4}$.

Supply the missing numbers:

	a	*b*	*c*
8.	$4\frac{1}{2} = 3 + 1\frac{1}{2} = 3\frac{?}{2}$	$5\frac{1}{2} = 4 + ? = 4\frac{?}{2}$	$3\frac{1}{4} = 2\frac{?}{4}$
9.	$5\frac{3}{4} = 4 + 1\frac{3}{4} = 4\frac{?}{4}$	$6\frac{3}{4} = 5 + ? = 5\frac{?}{4}$	$7\frac{3}{8} = 6\frac{?}{8}$

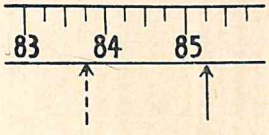
What are the missing numerators?

	a	*b*	*c*	*d*	*e*
10.	$5\frac{1}{2} = 4\frac{?}{2}$	$3\frac{1}{4} = 2\frac{?}{4}$	$4\frac{3}{4} = 3\frac{?}{4}$	$27\frac{3}{4} = 26\frac{?}{4}$	$25\frac{3}{8} = 24\frac{?}{8}$
11.	$4\frac{1}{8} = 3\frac{?}{8}$	$6\frac{2}{5} = 5\frac{?}{5}$	$7\frac{5}{8} = 6\frac{?}{8}$	$14\frac{2}{3} = 13\frac{?}{3}$	$37\frac{7}{10} = 36\frac{?}{10}$

SUBTRACTING LARGER MIXED NUMBERS

1. John weighs $85\frac{1}{4}$ pounds. Last year he weighed $83\frac{3}{4}$ pounds. How much heavier is he now than he was last year?

$$85\tfrac{1}{4} = 84\tfrac{5}{4}$$
$$\underline{83\tfrac{3}{4} = 83\tfrac{3}{4}}$$
$$1\tfrac{2}{4} = 1\tfrac{1}{2}$$



THINK: $85\frac{1}{4}$ lb. $- 83\frac{3}{4}$ lb. $= ?$

You cannot subtract $\frac{3}{4}$ from $\frac{1}{4}$, because $\frac{1}{4}$ has not as many fourths as $\frac{3}{4}$. To get more fourths, think of $85\frac{1}{4}$ as $84 + 1\frac{1}{4}$, or $84\frac{5}{4}$.

Rewrite the example as shown at the left. Then subtract the two numbers.

Reduce $\frac{2}{4}$ to $\frac{1}{2}$.

John is $1\frac{1}{2}$ pounds heavier.

2. Count on the scales by fourths to prove this work.

3. Why was $85\frac{1}{4}$ changed to $84\frac{5}{4}$? When is it necessary to change the upper number in subtracting mixed numbers?

4. Study the work below. Then copy and work the examples with your book closed.

a.
$$7\tfrac{1}{8} = 6\tfrac{9}{8}$$
$$\underline{-5\tfrac{5}{8} = 5\tfrac{5}{8}}$$
$$1\tfrac{4}{8} = 1\tfrac{1}{2}$$

b.
$$6\tfrac{1}{4} = 5\tfrac{5}{4}$$
$$\underline{-\tfrac{3}{4} = \tfrac{3}{4}}$$
$$5\tfrac{2}{4} = 5\tfrac{1}{2}$$

c.
$$9\tfrac{1}{3} = 8\tfrac{4}{3}$$
$$\underline{8\tfrac{2}{3} = 8\tfrac{2}{3}}$$
$$\tfrac{2}{3}$$

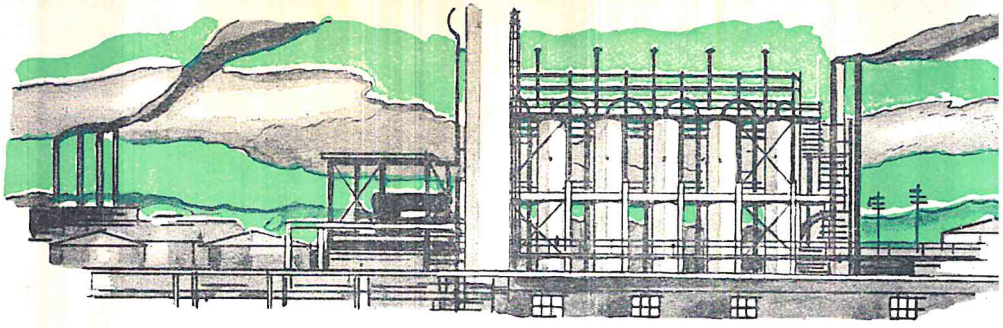
Supply the missing numbers:

	a	*b*	*c*
5.	$1\frac{1}{8} = \frac{?}{8}$	$7\frac{1}{8} = 6 + ?$	$7\frac{1}{8} = 6 + \frac{?}{8} = 6\frac{?}{8}$
6.	$1\frac{2}{5} = \frac{?}{5}$	$8\frac{2}{5} = 7 + ?$	$8\frac{2}{5} = 7 + \frac{?}{5} = 7\frac{?}{5}$
7.	$1\frac{3}{8} = \frac{?}{8}$	$4\frac{3}{8} = 3 + ?$	$7\frac{3}{8} = 6 + \frac{?}{8} = 6\frac{?}{8}$
8.	$1\frac{3}{10} = \frac{?}{10}$	$7\frac{7}{10} = 6 + ?$	$9\frac{1}{10} = 8 + \frac{?}{10} = 8\frac{?}{10}$

9. To what form must you change each of the mixed numbers given below if you wish to subtract $\frac{7}{8}$ from it?

$5\frac{1}{8}$ $\quad 7\frac{3}{8}$ $\quad 6\frac{5}{8}$ $\quad 9\frac{3}{8}$ $\quad 4\frac{4}{8}$ $\quad 1\frac{3}{8}$

10. Subtract $\frac{7}{8}$ from each of the mixed numbers above.



WHAT WE GET FROM PETROLEUM

Near where Alfred lives there is an oil refinery. In this refinery the petroleum that is pumped from oil wells in the neighborhood is changed into a number of different things.

A 42-gallon barrel of petroleum will yield the following:

$17\frac{1}{2}$ gallons of gasoline
18 gallons of fuel and gas oil
$2\frac{1}{2}$ gallons of kerosene
$1\frac{1}{2}$ gallons of lubricating oil
$2\frac{1}{2}$ gallons of by-products

1. Do these amounts total 42 gallons?

2. How many more gallons of gasoline than of kerosene are made from a barrel of petroleum? What are kerosene and gasoline used for?

3. How many less gallons of gasoline than of fuel and gas oil are produced from a barrel of petroleum? What are fuel and gas oil used for?

4. How many gallons are there in $\frac{1}{2}$ barrel of petroleum?

5. The gasoline produced from a barrel of petroleum is how many gallons less than a half barrel?

6. How many gallons in all of kerosene, lubricating oil, and by-products are produced from a barrel of petroleum?

*7. Lubricating oil is classified by number, as 10, 20, 30, and 40. Find out the kinds of lubricating oil used by different kinds of automobiles, and the kinds that are used in winter and in summer.

WHEN DO YOU CHANGE THE FRACTION?

1. Study the example below carefully.

$$\begin{array}{rcll} 5\frac{3}{8} & = & 4\frac{11}{8} & \text{Why do we change } 5\frac{3}{8} \text{ to } 4\frac{11}{8}? \\ -2\frac{7}{8} & = & 2\frac{7}{8} & \text{How do we change } 5\frac{3}{8} \text{ to } 4\frac{11}{8}? \\ & & 2\frac{4}{8} = 2\frac{1}{2} & \text{Why do we change } 2\frac{4}{8} \text{ to } 2\frac{1}{2}? \end{array}$$

2. In the examples below tell if the top numbers must be changed before you can subtract. How can you tell?

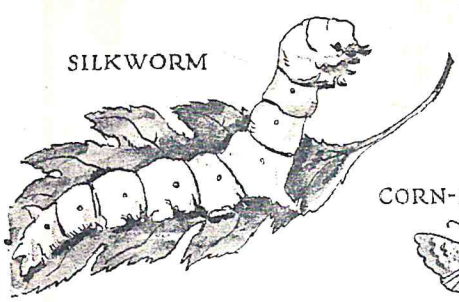
a.	*b.*	*c.*	*d.*	*e.*
$7\frac{1}{3}$	$5\frac{5}{6}$	$9\frac{1}{4}$	$8\frac{1}{2}$	$4\frac{1}{6}$
$-4\frac{2}{3}$	$-2\frac{1}{6}$	$-2\frac{3}{4}$	$-\frac{1}{2}$	$-2\frac{5}{6}$

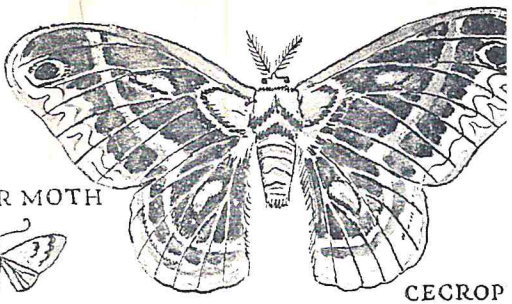
3. Subtract the examples in 2.

PRACTICE IN SUBTRACTING MIXED NUMBERS

Tell orally in which of the examples the top numbers must be changed before you can subtract. Then subtract.

	a	*b*	*c*	*d*	*e*	*f*	*g*
1.	$7\frac{1}{8}$ $4\frac{5}{8}$	$8\frac{2}{5}$ $4\frac{3}{5}$	$7\frac{3}{8}$ $4\frac{5}{8}$	$9\frac{1}{6}$ $7\frac{5}{6}$	$4\frac{3}{8}$ $3\frac{7}{8}$	$7\frac{1}{4}$ $3\frac{3}{4}$	$9\frac{2}{3}$ $6\frac{1}{3}$
2.	$4\frac{4}{8}$ $3\frac{7}{8}$	$12\frac{3}{8}$ $7\frac{5}{8}$	$9\frac{1}{8}$ $\frac{7}{8}$	$5\frac{1}{4}$ $\frac{3}{4}$	$9\frac{3}{5}$ $7\frac{4}{5}$	$6\frac{3}{8}$ $\frac{7}{8}$	$4\frac{2}{6}$ $3\frac{5}{6}$
3.	$8\frac{3}{6}$ $2\frac{5}{6}$	$5\frac{7}{8}$ $1\frac{5}{8}$	$6\frac{1}{4}$ $4\frac{2}{4}$	$8\frac{1}{3}$ $\frac{2}{3}$	$9\frac{1}{10}$ $8\frac{3}{10}$	$3\frac{6}{8}$ $\frac{7}{8}$	$7\frac{2}{5}$ $\frac{4}{5}$
4.	$8\frac{1}{4}$ $3\frac{3}{4}$	$8\frac{2}{5}$ $6\frac{3}{5}$	$7\frac{5}{6}$ $6\frac{1}{6}$	$6\frac{1}{8}$ $\frac{3}{8}$	$13\frac{2}{4}$ $9\frac{3}{4}$	$12\frac{1}{3}$ $\frac{2}{3}$	$13\frac{5}{8}$ $8\frac{6}{8}$
5.	$14\frac{4}{5}$ $7\frac{2}{5}$	$7\frac{3}{8}$ $\frac{5}{8}$	$15\frac{2}{4}$ $9\frac{3}{4}$	$14\frac{4}{8}$ $8\frac{5}{8}$	$5\frac{1}{3}$ $4\frac{2}{3}$	$12\frac{1}{4}$ $9\frac{2}{4}$	$11\frac{1}{6}$ $2\frac{3}{6}$
6.	$7\frac{1}{3}$ $6\frac{2}{3}$	$13\frac{2}{8}$ $9\frac{5}{8}$	$9\frac{1}{4}$ $\frac{3}{4}$	$8\frac{1}{5}$ $\frac{3}{5}$	$16\frac{5}{8}$ $8\frac{6}{8}$	$9\frac{3}{6}$ $7\frac{5}{6}$	$7\frac{3}{10}$ $\frac{7}{10}$





CORN-EAR MOTH

MOTHS—FRIENDS AND FOES

INDIAN-MEAL MOTH

1. The Indian-meal moth is one of our smallest but most harmful moths. It is often found in stored grain. Its wingspread is $\frac{3}{4}$ inch. One of the largest moths is the cecropia moth which has a wingspread of as much as $6\frac{1}{4}$ inches. How much greater is the wingspread of the cecropia than of the Indian-meal moth?

2. The corn-ear worm damages much green corn in the South. It changes to a moth with a wingspread of $1\frac{3}{4}$ inches. How much greater is its wingspread than that of the Indian-meal moth?

3. The corn-ear moth lays about 150 eggs. In one field a boy counted 35 of these moths. About how many eggs would these moths lay?

4. The silkworm moth lays about 350 eggs. About how many eggs would 20 silkworm moths lay?

5. Around each silkworm cocoon there is wrapped about 1,000 yards of silk. This can be unwound and wrapped on spools to be spun into thread. If the silk from 200 cocoons is spun on one spool, how many hundred thousand yards long is the silk thread? Write this number in figures.

6. It takes about 2,500 cocoons to produce one pound of raw silk. How many cocoons would be needed to produce 50 pounds of raw silk?

*7. Can you name some other moths and insects that damage things?

CORRECTING ERRORS IN SUBTRACTION OF FRACTIONS

The examples below contain the kinds of errors that boys and girls most often make in subtracting fractions. Study each example and find the error in it. Then copy the example and work it correctly

1. $\begin{array}{r} \frac{7}{8} \\ -\ \frac{1}{8} \\ \hline \frac{6}{8} \end{array}$

2. $\begin{array}{r} 8\frac{4}{5} \\ -2\frac{1}{5} \\ \hline 5\frac{3}{5} \end{array}$

3. $\begin{array}{r} 4\frac{2}{3} \\ -\frac{2}{3} \\ \hline 40 \end{array}$

4. $\begin{array}{r} 4 \\ -1\frac{3}{4} \\ \hline 3\frac{3}{4} \end{array}$

5. $\begin{array}{rcl} 12\frac{1}{4} & = & 11\frac{5}{4} \\ -9\frac{3}{4} & = & 9\frac{3}{4} \\ \hline & & 2\frac{2}{4} \end{array}$

6. $\begin{array}{rcl} 6\frac{1}{3} & = & 6\frac{4}{3} \\ -4\frac{2}{3} & = & 4\frac{2}{3} \\ \hline & & 2\frac{2}{3} \end{array}$

7. $\begin{array}{rcl} 9\frac{3}{5} & = & 8\frac{4}{5} \\ -7\frac{4}{5} & = & 7\frac{4}{5} \\ \hline & & 1 \end{array}$

8. $\begin{array}{rcl} 4\frac{1}{4} & = & 3\frac{5}{4} \\ -\frac{3}{4} & = & \frac{3}{4} \\ \hline & & \frac{2}{4} = \frac{1}{2} \end{array}$

9. $\begin{array}{rcl} 3\frac{1}{8} & = & 2\frac{11}{8} \\ -\frac{6}{8} & = & \frac{6}{8} \\ \hline & & 2\frac{5}{8} \end{array}$

PRACTICE IN SUBTRACTING FRACTIONS

These sets of examples contain all of the kinds of examples in subtracting fractions you have studied. How many of them can you work correctly?

Set I

	a	*b*	*c*	*d*	*e*	*f*	*g*
1.	$\begin{array}{r} 5\frac{2}{3} \\ 2\frac{1}{3} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{1}{2} \\ 2\frac{1}{2} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{3}{4} \\ 1\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 8\frac{1}{3} \\ 5\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{1}{4} \\ 5\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{1}{8} \\ \frac{3}{8} \\ \hline \end{array}$	$\begin{array}{r} 9\frac{3}{8} \\ \frac{7}{8} \\ \hline \end{array}$
2.	$\begin{array}{r} 1 \\ \frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} \frac{3}{5} \\ \frac{1}{5} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{7}{8} \\ \frac{3}{8} \\ \hline \end{array}$	$\begin{array}{r} \frac{1}{2} \\ \frac{1}{2} \\ \hline \end{array}$	$\begin{array}{r} 3 \\ 1\frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} 3 \\ \frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 4\frac{1}{2} \\ 2 \\ \hline \end{array}$

Set II

1.	$\begin{array}{r} 5 \\ 4\frac{1}{2} \\ \hline \end{array}$	$\begin{array}{r} \frac{2}{3} \\ \frac{1}{3} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{5}{6} \\ 1\frac{1}{6} \\ \hline \end{array}$	$\begin{array}{r} \frac{7}{8} \\ \frac{1}{8} \\ \hline \end{array}$	$\begin{array}{r} \frac{3}{8} \\ \frac{3}{8} \\ \hline \end{array}$	$\begin{array}{r} 9\frac{1}{4} \\ 3\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 6 \\ 1\frac{1}{3} \\ \hline \end{array}$
2.	$\begin{array}{r} 9\frac{1}{2} \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 7\frac{1}{4} \\ 5\frac{2}{4} \\ \hline \end{array}$	$\begin{array}{r} 1 \\ \frac{3}{5} \\ \hline \end{array}$	$\begin{array}{r} 4\frac{1}{3} \\ \frac{1}{3} \\ \hline \end{array}$	$\begin{array}{r} 2 \\ \frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 12\frac{1}{3} \\ 5\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 2\frac{1}{8} \\ \frac{5}{8} \\ \hline \end{array}$

HOW LARGE ARE BIRDS?

John has a book that tells many interesting things about birds. Here is what the book told him about the average lengths of some kinds of birds when they are full-grown.

Quail	10 in.	Warbler	$5\frac{1}{4}$ in.
Humming bird	$3\frac{3}{4}$ in.	Mallard duck	23 in.
Swallow	$7\frac{1}{4}$ in.	Wood thrush	$8\frac{1}{4}$ in.
Crow	$19\frac{1}{2}$ in.	Bald eagle	35 in.

Have you ever seen any of these birds?

1. Which of the birds listed above is the smallest?
2. Which of the birds is the largest? Which bird is called "our national bird"?
3. How much longer than a humming bird is a swallow? Draw lines on the blackboard showing the lengths of these birds.
4. How much shorter than a quail is a warbler?
5. Find the difference between the lengths of the swallow and the warbler; of the swallow and the wood thrush.
6. Is the crow twice as long as the quail?

*7. How tall do ostriches grow?

*8. Are full-grown chickens all of the same size?

*9. What is being done to protect bird life?

THE MILK WE DRINK AND EAT

How much milk do you drink a day? Why is milk good for you?

Milk Is Good For You	
$\frac{1}{2}$ pint	5¢
1 pint	7¢
1 quart	11¢

1. The sign at the right shows the cost of milk in bottles of different sizes at a certain store. How many half pints make a whole pint?

2. How much more than one pint bottle do two half-pint bottles cost?

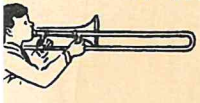
3. How much more does a quart of milk cost in pint bottles than in a quart bottle? Can you tell why the price a quart is higher when milk is sold in pint bottles?

4. How much does a quart of milk bought in half-pint bottles cost? How much more is this than the price of a quart bottle?

5. There are two glasses of milk in a pint. How many quarts of milk are needed for a class of 40 children, if each child is to have a glass of milk?

6. A very good cow gives about 30 quarts of milk a day. How many glasses of milk is this?

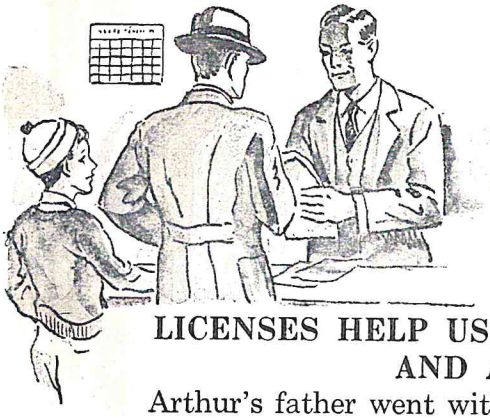
*7. What foods do we get from milk?



LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$9 - 2\frac{1}{2}$	$2\frac{3}{4} + 4\frac{1}{4}$	87×50	$8\frac{3}{4} - 2\frac{1}{4}$	$40\overline{)273}$
2.	296×64	$34\overline{)176}$	$6\frac{2}{3} + 5\frac{2}{3}$	$13000 - 9704$	$1\frac{3}{8} - \frac{7}{8}$
3.	$86\overline{)621}$	$7\frac{1}{4} - 2\frac{3}{4}$	$\frac{1}{4}$ of 392 =	$7\frac{3}{8} + 5\frac{1}{8}$	$\frac{552}{77}$

4. $3785 + 93 + 864 + 8 =$



LICENSE BUREAU			
Hunting	$5.00	Bicycle	$ .25
Fishing	$1.50	Restaurant	$25.00
Dog	$2.00	Peddler	$10.00

LICENSES HELP US TO PROTECT PEOPLE AND ANIMALS

Arthur's father went with him to the City Hall to buy Arthur a fishing license. They saw the notice above giving a list of licenses that were sold there and the cost of each. Can you tell why we have each kind of license? What other kinds of licenses are there?

1. Arthur said, "Does it cost $1.50 for me to fish?" "No," his father said. "Your license will cost only half as much." How much did Arthur's license cost?

2. "The law says that you will lose your license or have to pay a fine if you keep a black bass less than 8 inches long," Arthur's father told him. He caught a bass only $6\frac{3}{4}$ inches long. How much too short was it? What did he have to do with it? Why do we have game wardens?

3. Later he caught a bass $9\frac{1}{4}$ inches long. How much longer than the law required was this fish?

4. Arthur caught two pike, one weighing $8\frac{3}{4}$ pounds, the other $7\frac{3}{4}$ pounds. How much did the two fish weigh?

5. One morning Arthur caught 8 perch that weighed in all 12 pounds. What was their average weight?

6. Arthur uses frogs as bait to catch bass. Frogs are sold at 3 for 10 cents. How much do 9 frogs cost?

7. Sometimes he uses minnows for bait. They sell at 5 cents a dozen. How many minnows can he buy for 25 cents?

*8. Find out how much fishing licenses cost where you live and how the money raised by them is used.

DIAGNOSTIC TEST IN SUBTRACTION OF FRACTIONS

This test will help you to find out if you need more practice in subtraction of fractions.

	a	*b*	*c*	*d*	*e*	*f*	
1.	1 $-\frac{1}{2}$	1 $-\frac{3}{4}$	1 $-\frac{1}{8}$	1 $-\frac{1}{3}$	1 $-\frac{2}{5}$	1 $-\frac{5}{6}$	(180)
2.	2 $-\frac{1}{4}$	3 $-\frac{1}{2}$	4 $-\frac{2}{3}$	6 $-\frac{3}{8}$	7 $-\frac{3}{10}$	5 $-\frac{3}{5}$	(182)
3.	4 $-1\frac{1}{2}$	6 $-5\frac{1}{4}$	7 $-2\frac{2}{3}$	5 $-4\frac{1}{6}$	3 $-1\frac{3}{4}$	4 $-3\frac{4}{5}$	(183)
4.	$1\frac{1}{3}$ $-\frac{2}{3}$	$1\frac{1}{8}$ $-\frac{5}{8}$	$1\frac{3}{10}$ $-\frac{5}{10}$	$1\frac{1}{6}$ $-\frac{5}{6}$	$1\frac{3}{8}$ $-\frac{5}{8}$	$1\frac{2}{5}$ $-\frac{3}{5}$	(186)
5.	$7\frac{1}{3}$ $-5\frac{2}{3}$	$8\frac{1}{4}$ $-7\frac{3}{4}$	$6\frac{1}{8}$ $-\frac{5}{8}$	$7\frac{1}{4}$ $-\frac{3}{4}$	$5\frac{3}{5}$ $-\frac{4}{5}$	$4\frac{3}{10}$ $-\frac{7}{10}$	(189)

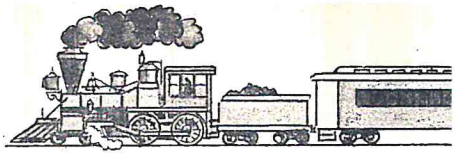
If you made errors in only one or two examples in a row, correct your errors at once. If you made errors in three or more examples in a row, turn for help to the pages indicated at the right of the row. If you need more help, ask your teacher. Then rework the examples you missed.

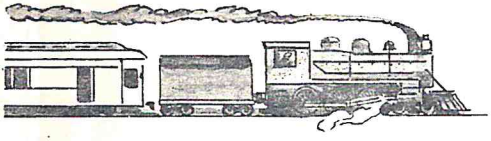
Repeat the test on subtraction of fractions on page 119.

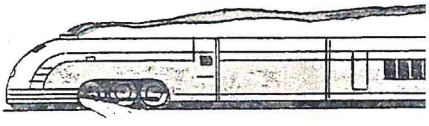
*INTERESTING FACTS TO FIND OUT

If you do not need more practice, prepare a special report on one of the topics given below.

1. Finding distances on a road map.
2. The cows that produce the most milk.
3. How kerosene lamps burn.
4. The sizes of butterflies.
5. The damage done by the corn borer and boll weevil.







FASTER AND FASTER

1. In 1812 it took about 144 hours to go by coach from Pittsburgh to Philadelphia, a distance of about 360 miles. In 1854 it took $15\frac{1}{4}$ hours to go this distance by rail. How much less time did it take by rail in 1854 than by coach in 1812?

2. In 1920 trains were much faster than in 1854. Then it took only $8\frac{3}{4}$ hours to make the trip from Pittsburgh to Philadelphia by rail. How much less was this than the time it took by coach in 1812? by rail in 1854?

3. Today there are fast trains that make the distance in $6\frac{3}{4}$ hours. How much less is this than the time in 1854? in 1920?

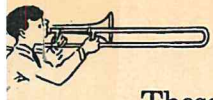
4. If a train averaged 60 miles an hour, how long would it take the train to go from Pittsburgh to Philadelphia?

5. An airplane can fly from Pittsburgh to Philadelphia in about $1\frac{3}{4}$ hours. How much less time is this than the time needed by coach in 1812? by train in 1854? by the fast trains of today?

*6. Which trip should take less time, the trip by airplane from Pittsburgh to Philadelphia, or the trip by airplane from Philadelphia to Pittsburgh? Why?

*7. Can a train go as fast on a track full of curves as on a track that is straight? Why?

*8. When and where was the first railroad built? Why do trains go faster now than in 1854?



LET'S PRACTICE

These sets of examples contain the kinds of examples you have learned to work. Use one set a day in practice. Be sure to copy the numbers correctly and to allow enough space for your work.

Set I

1. $\begin{array}{r} 129 \\ 8446 \\ 397 \\ 648 \\ 7554 \\ 465 \\ \hline \end{array}$

2. $\begin{array}{r} 4\frac{3}{4} \\ -2\frac{1}{4} \\ \hline \end{array}$

3. $66\overline{)534}$

4. $\begin{array}{r} 3 \\ -\frac{1}{4} \\ \hline \end{array}$

5. $6\overline{)57}$

6. $\begin{array}{r} 4\frac{1}{3} \\ +2\frac{2}{3} \\ \hline \end{array}$

7. $\begin{array}{r} 3\frac{3}{5} \\ -1\frac{1}{5} \\ \hline \end{array}$

8. $\begin{array}{r} 4 \\ +2\frac{1}{2} \\ \hline \end{array}$

9. $84\overline{)771}$

10. $\begin{array}{r} 48 \\ \times 30 \\ \hline \end{array}$

Set II

1. $\begin{array}{r} \$3.39 \\ .38 \\ 82.34 \\ .65 \\ 2.38 \\ 2.06 \\ \hline \end{array}$

2. $\begin{array}{r} 5\frac{1}{4} \\ -2 \\ \hline \end{array}$

3. $\begin{array}{r} \$\ 87.65 \\ -29.58 \\ \hline \end{array}$

4. $\begin{array}{r} 1\frac{1}{4} \\ -\frac{3}{4} \\ \hline \end{array}$

5. $94\overline{)671}$

6. $\begin{array}{r} 6\frac{5}{8} \\ +3\frac{7}{8} \\ \hline \end{array}$

7. $\frac{1}{8}$ of 72 =

8. $\begin{array}{r} 6\frac{1}{4} \\ -2\frac{3}{4} \\ \hline \end{array}$

9. $63\overline{)280}$

10. $\begin{array}{r} 375 \\ \times 68 \\ \hline \end{array}$

USING THE VOCABULARY OF ARITHMETIC

Give the names of the measures used in measuring each of the following:

sugar	wheat	hay	water	potatoes
oil	oranges	spices	age	cookies
coal	milk	speed	cloth	apples
butter	a boy's height	cotton	corn	vinegar

HOW WELL DO YOU REMEMBER?

1. How can you tell if a fraction is reduced to lowest terms? Is the fraction $\frac{8}{12}$ reduced to lowest terms?

2. What are the steps in working these examples?

   a. $2\frac{1}{4} + 3\frac{1}{4} =$ *b.* $4\frac{3}{4} - 2\frac{1}{4} =$

3. What do we call fractions such as $\frac{2}{2}$ and $\frac{7}{4}$?

4. Show by circles that $2 = 1\frac{2}{2}$.

5. Reduce to mixed numbers expressed in simplest form:

   $\frac{3}{2}$ $\frac{4}{2}$ $\frac{5}{2}$ $\frac{8}{4}$ $\frac{6}{4}$ $\frac{10}{8}$ $\frac{5}{4}$ $\frac{10}{4}$

6. Express these numbers in simplest form:

   $4\frac{2}{2}$ $6\frac{5}{4}$ $7\frac{3}{2}$ $5\frac{6}{4}$ $6\frac{6}{8}$ $9\frac{7}{4}$ $6\frac{3}{3}$

7. Give each step in working the example at the right:

$$\begin{array}{r} 4\frac{3}{4} \\ +6\frac{3}{4} \end{array}$$

8. What is a "quarter note" in music?

9. Supply the missing numerators:

   $1 = \frac{\quad}{4}$ $1 = \frac{\quad}{2}$ $3 = 2\frac{\quad}{4}$ $5 = 4\frac{\quad}{8}$

10. How do you subtract $\frac{3}{4}$ from 1? from 4?

11. Show by circles that $1\frac{1}{4} = \frac{5}{4}$.

12. Supply the missing numerators:

    $1\frac{3}{4} = \frac{\quad}{4}$ $1\frac{3}{8} = \frac{\quad}{8}$ $4\frac{1}{4} = 3\frac{\quad}{4}$ $6\frac{5}{8} = 5\frac{\quad}{8}$

13. In which of these examples must the upper number be changed in subtracting? Explain why.

a.	*b.*	*c.*	*d.*	*e.*
$7\frac{3}{4}$	$6\frac{1}{4}$	$5\frac{7}{8}$	$4\frac{1}{8}$	$6\frac{3}{8}$
$-1\frac{3}{4}$	$-5\frac{3}{4}$	$-4\frac{1}{8}$	$-3\frac{3}{8}$	-4

14. Explain carefully each step in working the example $5\frac{1}{4} - 3\frac{3}{4}$.

15. Show by drawing lines with a ruler that $\frac{3}{4}$ in. + $\frac{3}{4}$ in. = $1\frac{1}{2}$ in.

MEASURING GROWTH IN PROBLEM SOLVING

1. The Jones family used 14 loaves of bread one week. At 9 cents a loaf, how much did the 14 loaves cost?

2. At a sale, Peggy's mother bought her a $17.50 coat for $14.95. How much was the reduction?

3. A dressmaker paid $1.50 for 30 spools of thread. How much did she pay for one spool of thread?

4. Jack is $57\frac{1}{4}$ inches tall. Allen is $60\frac{3}{4}$ inches tall. How much taller than Jack is Allen?

5. May divided each of three small cakes into fourths. How many pieces of cake were there in all?

6. David's father has a speedboat. One Saturday the speedboat went 6 miles in 15 minutes. How long did it take the speedboat to go one mile?

7. It took John from 8 o'clock to 12 o'clock to pull the weeds in Mr. Grace's garden. He was paid 25 cents an hour for his work. How much did he earn?

8. Arthur weighed three rolls of butter. One weighed $3\frac{3}{8}$ pounds, one weighed $4\frac{3}{8}$ pounds, and one weighed 5 pounds. How much was the total weight of the three rolls of butter?

9. There are 19 boys and 18 girls in a class at the Jackson School. If each child sells 10 tickets for the school play, how many tickets will they sell in all?

10. The school bought a set of reference books for $48.75, and 25 books that cost $.88 each. How much did all of these books cost?

What Your Score Means

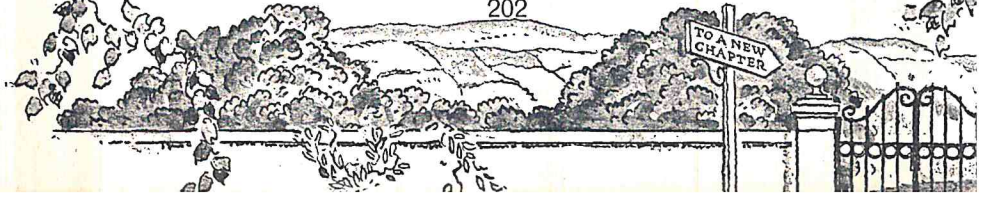
Unsatisfactory	Fair	Good	Excellent
0 1 2 3 4	5 6	7 8	9 10

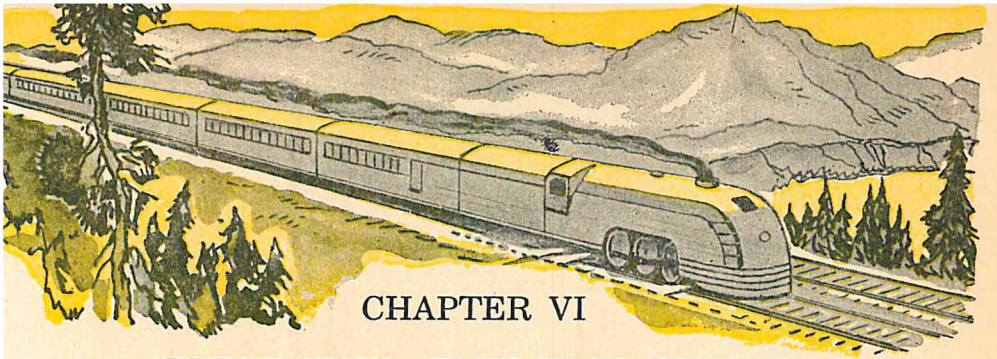
OPENING THE GATE TO THE NEW CHAPTER

Use this test to find how well you have learned to work the kinds of examples you have studied. Try to have every example right. Be sure to copy the numbers correctly.

1. Multiply \$3.85 by 46. (69)
2. How much is 20×49? (49)
3. Divide the number 2868 by 7. (33)
4. How much is $\frac{1}{8}$ of 320? (29)
5. Divide and check: $70\overline{)613}$ (135)
6. Divide and check: $38\overline{)80}$ (137)
7. Divide 470 by 86. (145)
8. Divide 332 by 76 and check the answer. (145)
9. Reduce to lowest terms: $\frac{6}{8}$, $\frac{4}{8}$, $\frac{5}{10}$. (94)
10. How much is $2\frac{1}{4} + 7\frac{1}{4}$? (102)
11. How much is $6\frac{3}{4} - 5\frac{1}{4}$? (114)
12. Express in simplest form: $\frac{4}{4}$, $\frac{3}{2}$, $\frac{9}{6}$. (164)
13. Add these fractions: $\frac{3}{4} + \frac{1}{4} + \frac{3}{4} = ?$ (165)
14. Express in simplest form: $5\frac{4}{4}$, $6\frac{3}{2}$, $2\frac{6}{4}$. (164)
15. Find the sum of $4\frac{1}{2}$ and $5\frac{1}{2}$. (168)
16. How much is $4\frac{3}{4}$ inches plus $5\frac{3}{4}$ inches? (168)
17. Draw a square. Color $\frac{1}{4}$ of it. What part is not colored? (180)
18. How much more than $3\frac{1}{2}$ pounds is 6 pounds? (183)
19. How much less than $1\frac{1}{3}$ yard is $\frac{2}{3}$ yard? (186)
20. Subtract $6\frac{3}{4}$ from $11\frac{1}{4}$. (189)

After your paper has been marked, study and do again any examples you worked incorrectly. If you need help, turn to the pages given at the right.





CHAPTER VI

THREE WAYS—TAKE YOUR CHOICE

Ann planned to take a trip from Denver to Chicago. She knew that she could go by bus, by rail, or by airplane. Here are some things that she found about the cost of these ways of traveling.

1. The distance by rail is 1,047 miles. At $.02 a mile how much would the fare be?

2. The fare by bus was $16.75. How much less than the fare by rail was this?

3. The fare by airplane was $53.20. How much more than the fare by rail was the fare by airplane? How much more than the fare by bus was the fare by airplane?

4. The ordinary train goes from Denver to Chicago in $31\frac{3}{4}$ hours. A fast streamliner like the one shown in the picture makes the trip in $15\frac{1}{4}$ hours. Find the difference in time.

5. The bus makes the trip in 35 hours. How much longer than it takes the streamliner does it take the bus to make the trip?

6. The airplane makes the trip in $6\frac{1}{4}$ hours. How much longer does it take the ordinary train? the streamliner? the bus?

*7. Why are the fares on trains, buses, and airplanes not the same? If you were in Ann's place, which of these ways would you choose to travel?

HOW TO WORK LONGER DIVISION EXAMPLES

Study very carefully the steps below in working the example, 672 ÷ 21. $21\overline{)672}$

I. To find the first quotient figure, think: I cannot divide 6 by 21, so I will take 67. $21\overline{)67}$. 672 is called the dividend. We call 67 the **partial dividend.** 67 is 67 tens.

```
  3
21)672
  63
  4
```

Step 1. TEST FOR THE QUOTIENT FIGURE. Think: $2\overline{)6} = 3$. Try 3 as the first quotient figure.

Step 2. PLACE THE QUOTIENT FIGURE. Write 3 above the 7 of 67, because you are dividing 67 tens by 21, and the 7 is in tens' place.

Step 3. MULTIPLY 21 by 3. Write 63 under 67.

Step 4. COMPARE 63 with 67. Can these numbers be subtracted?

```
  3
21)672
  63x
  42
```

Step 5. SUBTRACT 63 from 67. This gives 4.

Step 6. COMPARE 4 with 21. The remainder must be less than the divisor. 4 is less than 21.

Step 7. BRING DOWN the 2 in 672, placing it after the 4. Put an x under the 2 in 672 to show that you have brought down the 2.

II. To find the second quotient figure, divide 42 by 21. Repeat the steps used in finding the first quotient figure.

```
 32
21)672
 63x
 42
 42
 --
```

Step 1. TEST FOR QUOTIENT FIGURE. Think: $2\overline{)4} = 2$. Try 2 as the second quotient figure.

Step 2. PLACE THE QUOTIENT FIGURE. Write 2 in the quotient in the ones' place.

Step 3. MULTIPLY 21 by 2. Write 42 under the 42.

Step 4. COMPARE 42 and 42. Can these numbers be subtracted?

Step 5. SUBTRACT 42 from 42. There is no remainder. There is no number to bring down.

To check: Multiply 32 by 21.

STUDYING EXAMPLES IN DIVISION

Study these examples carefully. Copy and work them with your book closed.

1.	2.	3.	4.
23	23	11	13
30)690	21)483	41)451	23)299
60x	42x	41x	23x
90	63	41	69
90	63	41	69

In the examples below, the quotients are given. Complete the work by doing the multiplication and subtraction.

5.	6.	7.	8.	9.
42	21	13	21	21
21)882	42)882	22)286	33)693	31)651

Divide, and check your work:

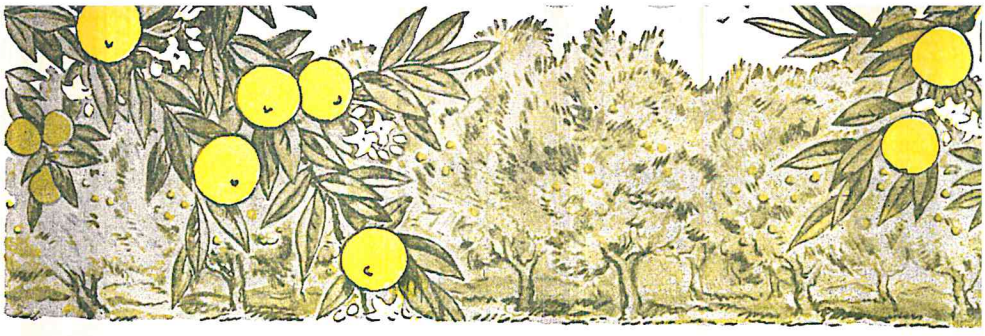
10. 23)483	12. 33)693	14. 31)682	16. 21)672
11. 21)273	13. 21)861	15. 31)372	17. 11)495

Study, then work these examples.

1.	2.	3.	4.
23	22	14	32
22)506	45)990	22)308	24)768
44x	90x	22x	72x
66	90	88	48
66	90	88	48

Copy these examples and complete the work.

	a	*b*	*c*	*d*	*e*
5.	23 25)575	43 22)946	42 23)966	21 34)714	43 23)989
6.	41 24)984	22 32)704	23 31)713	24 21)504	34 22)748
7	12 43)516	21 46)966	21 28)588	22 36)792	22 27)594



LIQUID SUNSHINE

1. Arthur saw a large orange grove last summer. It contained 45 rows of trees with 36 trees in a row. How many trees were there in the grove?

2. Arthur's father told him that orange trees begin to bear fruit when five years old. They bear fruit from 50 to 80 years. He told of an orange tree in Europe five centuries old that still bore fruit. A century is 100 years. About how many years had it probably borne fruit?

3. An orange tree may produce 400 to 1000 oranges in a good season. How many oranges will be produced in a lifetime of 80 years by a tree that bears on the average 750 oranges a year? Why may a tree in some years bear very little fruit?

4. A single orange tree, the records show, produced in one year 10,218 oranges. At the rate of 2 cents each, what was the value of these oranges?

5. In a grocery store Mary saw two boxes of oranges, one marked 18 cents a dozen, the other marked 30 cents a dozen. Can you give reasons why the prices were different?

6. In one filled box there were 108 oranges. In another box of the same size there were 228 oranges. Find the difference in the number of oranges in the two boxes. In which box were there the larger oranges? How are oranges packed so that they will not spoil easily?

7. A grocer bought a box containing 144 oranges. How much did he receive for the oranges if he sold them at 25 cents a dozen?

8. If the grocer paid $2.75 for the box of oranges, how much more did he receive for the oranges than he paid for them?

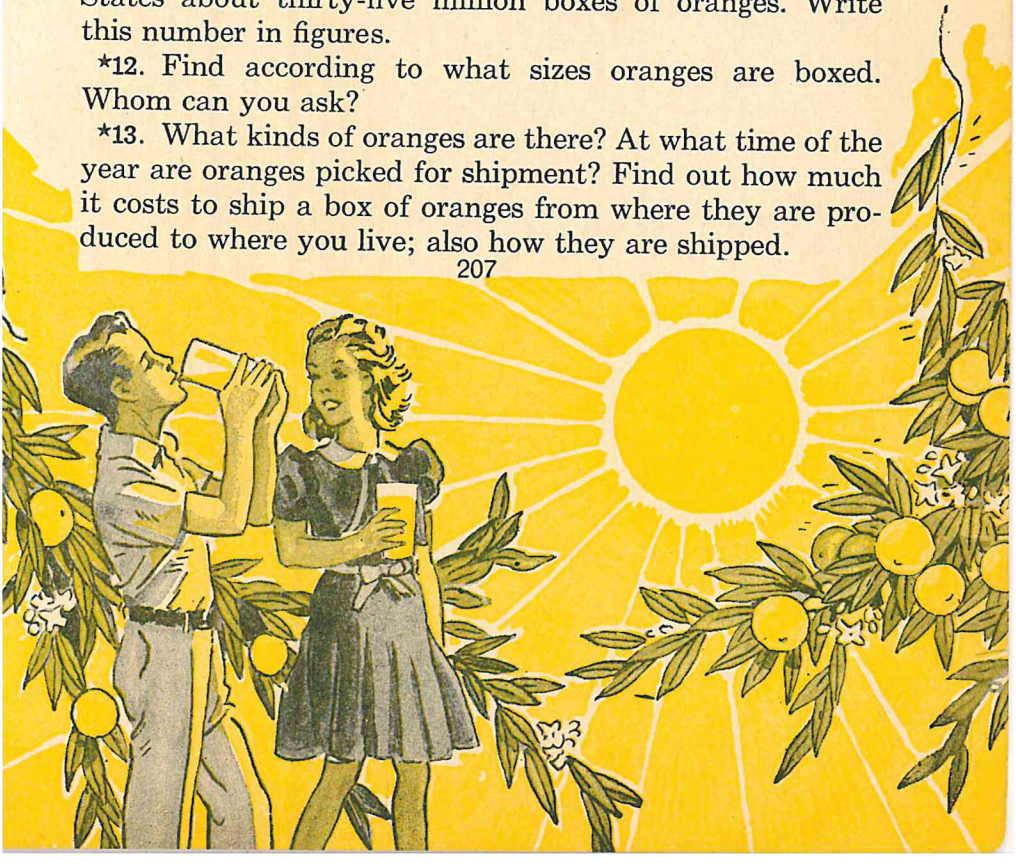
9. A small orange grove produced in all 98 boxes of oranges. At $3.50 a box how much did the owner receive for the oranges?

10. In California Arthur saw many stands by the roadside in front of orange groves. At one of them orange juice was sold at 48 cents a gallon. How much was this a quart? a pint? a glassful (counting 2 glassfuls to a pint)?

11. In a recent year there were grown in the United States about thirty-five million boxes of oranges. Write this number in figures.

*12. Find according to what sizes oranges are boxed. Whom can you ask?

*13. What kinds of oranges are there? At what time of the year are oranges picked for shipment? Find out how much it costs to ship a box of oranges from where they are produced to where you live; also how they are shipped.



REMAINDERS IN DIVISION

1. Helen's father, who is a florist, picked 148 beautiful red roses. How many boxes of a dozen roses each could he fill? How many roses would he have left?

$$\begin{array}{r} 12 \text{ r}4 \\ 12\overline{)148} \\ 12^{x} \\ \hline 28 \\ 24 \\ \hline 4 \end{array}$$

THINK: 148 ÷ 12 = ?

Explain each step in this example. Notice how the remainder is written in the model. Tell how to check this example.

He could fill 12 boxes and would have 4 roses left.

Study the following examples carefully. Then copy, and work them with your book closed.

2. $\begin{array}{r} 44 \text{ r}9 \\ 20\overline{)889} \\ 80^{x} \\ \hline 89 \\ 80 \\ \hline 9 \end{array}$

3. $\begin{array}{r} 14 \text{ r}7 \\ 21\overline{)301} \\ 21^{x} \\ \hline 91 \\ 84 \\ \hline 7 \end{array}$

4. $\begin{array}{r} 24 \text{ r}3 \\ 24\overline{)579} \\ 48^{x} \\ \hline 99 \\ 96 \\ \hline 3 \end{array}$

5. $\begin{array}{r} 12 \text{ r}17 \\ 33\overline{)413} \\ 33^{x} \\ \hline 83 \\ 66 \\ \hline 17 \end{array}$

Divide and check your work:

	a	*b*	*c*	*d*	*e*
1.	$33\overline{)697}$	$20\overline{)487}$	$42\overline{)896}$	$24\overline{)271}$	$40\overline{)492}$
2.	$20\overline{)691}$	$21\overline{)894}$	$30\overline{)981}$	$36\overline{)804}$	$45\overline{)997}$
3.	$40\overline{)845}$	$67\overline{)762}$	$24\overline{)778}$	$20\overline{)879}$	$46\overline{)970}$
4.	$23\overline{)486}$	$43\overline{)478}$	$31\overline{)345}$	$11\overline{)387}$	$12\overline{)389}$
5.	$21\overline{)903}$	$23\overline{)513}$	$21\overline{)514}$	$32\overline{)407}$	$23\overline{)715}$
6.	$23\overline{)554}$	$35\overline{)428}$	$52\overline{)644}$	$23\overline{)322}$	$24\overline{)314}$

AUTOMOBILES, A HUGE BUSINESS

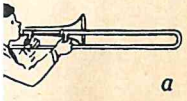
1. In a recent year 6,352,998 automobiles were produced in the whole world. The United States alone produced 4,808,974 automobiles. How many more automobiles were produced in the United States than in the rest of the world?

2. That year there were registered in the world 42,677,948 motor cars. In the United States there were 29,705,220 motor cars. How many cars were there outside the United States? Why are motor cars registered?

3. That year in the United States about four hundred million dollars was received for registration fees. Write this number in figures. What is the money raised in this way used for in your state?

4. In Switzerland a license for a certain $950 car cost $157.50. The license for the same car in a state in this country was only $18.40. Find the difference in the cost of the licenses. Find out about the cost of a license for such a car in your state and in neighboring states.

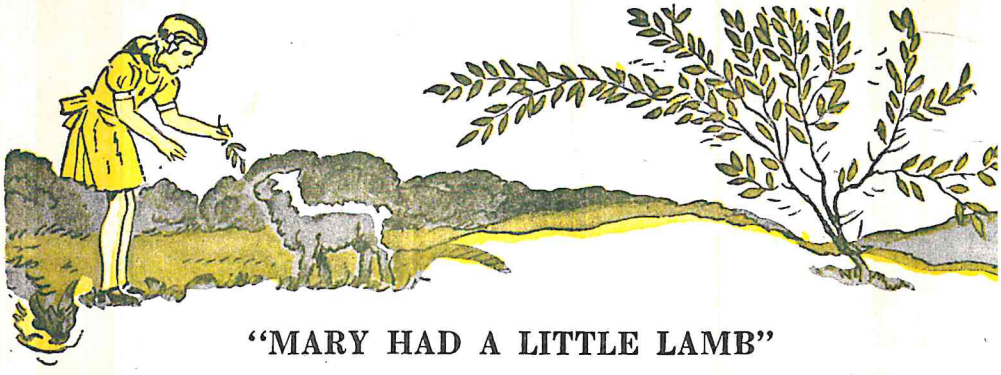
*5. That year 6,037,000 persons were given employment by the motor industry. Is this number more or less than the number of people living in your state?



LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$\frac{480}{20}$	36×70	$3\frac{1}{4} + 4\frac{1}{4}$	$78\overline{)473}$	$9 - 5\frac{1}{4}$
2.	$8765 - 3978$	$6\frac{7}{8} - 2\frac{3}{8}$	$46\overline{)278}$	$6\frac{5}{8} + 7\frac{7}{8}$	$\$4.83 \times 52$
3.	$6\frac{1}{2} + 5\frac{1}{2}$	$92\overline{)3443}$	$8\frac{1}{4} - 6\frac{3}{4}$	$\frac{1}{6}$ of 588 =	$1\frac{1}{5} - \frac{3}{5}$

4. Find the sum of $.68, $75.67, $6, and $.87.



"MARY HAD A LITTLE LAMB"

1. Mary had a pet lamb. It weighed $8\frac{1}{2}$ pounds when it was born in March. In August it weighed 78 pounds. How much did it gain in weight from March to August?

"ITS FLEECE WAS WHITE AS SNOW"

2. The next spring it weighed $168\frac{3}{4}$ pounds just before its wool was clipped. After clipping, Mary weighed the fleece carefully and found that it weighed $9\frac{1}{4}$ pounds. How much did Mary's pet weigh after its fleece had been clipped?

3. Mary's father had 65 sheep. The wool clipped from all of these weighed 585 pounds. How much was the average weight of the wool from the sheep?

4. Another farmer said that he had clipped 816 pounds of wool from his sheep. Find the number of sheep he had, counting 8 pounds as the weight of wool for one sheep.

5. How much would the wool for a flock of 258 sheep weigh if the average weight of the wool was 8 pounds a sheep?

6. Mary's father gave her 50 pounds of wool to sell. She found that she could sell the wool for 23 cents a pound. How much should she receive for the wool?

7. Mary saw a large fleece that weighed $18\frac{3}{4}$ pounds. How much more was this than the weight of the fleece of her pet?

*8. What is wool used for? What is "grease wool"?

PLACING QUOTIENT FIGURES CORRECTLY

1. A load of apples in boxes weighed 1,768 pounds. Each box weighed 34 pounds. There were how many boxes in all?

Find the first partial dividend like this:

```
  52
34)1768
 170x
 ----
  68
  68
```

Will 1 contain 34? Will 17? Will 176? The first number that will contain 34 is 176. So think, how many 34's in 176? How do we find the 5? Why was the 5 placed above the 6? How do we get the 170? Explain the rest of the work. Check the answer.

There were 52 boxes of apples.

Study these examples. Then copy and work them.

```
    55          42 r5          37 r19          53 r8
2. 21)1155  3. 33)1391  4. 92)3423  5. 45)2393
   105x        132x          276x          225x
   ----        ----          ----          ----
    105          71           663           143
    105          66           644           135
    ---          --           ---           ---
                  5            19             8
```

Go over each set of examples first orally. Tell where the first quotient figure will be placed. Then divide.

	a	*b*	*c*	*d*	*e*
1.	52)1768	71)3053	51)1275	31)1333	62)1488
2.	62)1493	81)4980	75)3156	92)3188	33)1066
3.	53)2389	44)2379	35)1480	54)2484	92)1932
4.	93)4876	32)1472	61)4942	64)2240	76)3220

PRACTICE IN DIVISION

1.	12)384	23)534	13)278	45)950	34)1782
2.	20)1860	41)943	60)5749	36)1123	42)1008
3.	43)946	54)729	11)782	21)945	56)1206
4.	24)538	30)2867	25)328	48)1536	40)3582

THE CORRECT ORDER OF DIVISION STEPS

In working the examples below be sure to follow the steps in division. Go over the work at each step a second time. Then check your answers by multiplication.

	a	*b*	*c*	*d*	*e*
1.	$34\overline{)1198}$	$82\overline{)3526}$	$74\overline{)4529}$	$43\overline{)1462}$	$22\overline{)774}$
2.	$54\overline{)1961}$	$78\overline{)1248}$	$95\overline{)7889}$	$84\overline{)3528}$	$43\overline{)2759}$
3.	$61\overline{)5870}$	$32\overline{)1664}$	$90\overline{)5012}$	$74\overline{)5438}$	$48\overline{)1537}$
4.	$93\overline{)4929}$	$36\overline{)868}$	$65\overline{)3445}$	$82\overline{)1722}$	$85\overline{)6170}$
5.	$57\overline{)2424}$	$21\overline{)1155}$	$95\overline{)6037}$	$46\overline{)1070}$	$54\overline{)2430}$
6.	$96\overline{)5207}$	$63\overline{)1575}$	$56\overline{)2892}$	$86\overline{)5428}$	$65\overline{)2239}$

SOMETHING IS WRONG

These division examples do not check. Find the errors in the work. Then work the examples correctly.

1.
$$\begin{array}{r} 41\text{ r}5 \\ 24\overline{)989} \\ 96 \\ \hline 29 \\ 24 \\ \hline 5 \end{array}$$

Check:
$$\begin{array}{r} 41 \\ \times 24 \\ \hline 164 \\ 820 \\ \hline 984 \end{array}$$

2.
$$\begin{array}{r} 24\text{ r}5 \\ 36\overline{)869} \\ 72 \\ \hline 149 \\ 144 \\ \hline 5 \end{array}$$

Check:
$$\begin{array}{r} 24 \\ \times 36 \\ \hline 144 \\ 620 \\ \hline 764 \\ +5 \\ \hline 769 \end{array}$$

3.
$$\begin{array}{r} 36\text{ r}20 \\ 65\overline{)2350} \\ 195 \\ \hline 400 \\ 380 \\ \hline 20 \end{array}$$

Check:
$$\begin{array}{r} 36 \\ \times 65 \\ \hline 180 \\ 2160 \\ \hline 2340 \\ +20 \\ \hline 2360 \end{array}$$

4.
$$\begin{array}{r} 94\text{ r}18 \\ 54\overline{)4994} \\ 486 \\ \hline 234 \\ 216 \\ \hline 18 \end{array}$$

Check:
$$\begin{array}{r} 94 \\ \times 54 \\ \hline 376 \\ 4700 \\ \hline 5076 \\ +18 \\ \hline 5094 \end{array}$$

DIVIDING DOLLARS AND CENTS

1. The class hired a bus to go to the museum. If there were 32 pupils in the class and it cost $8.00 to hire the bus, how much was each pupil's share?

$$\begin{array}{r} \$.25 \\ 32\overline{)\$8.00} \\ 6\ 4^{x} \\ \hline 1\ 60 \\ 1\ 60 \\ \hline \end{array}$$

THINK: $8.00 ÷ 32 = ?

Divide dollars and cents just as you divide other numbers. Put the dollar sign before the answer. Put the decimal point in the quotient directly above the decimal point in the number you are dividing. Study the model. Each pupil's share was $.25.

2. Suppose the cost of the bus had been $8.50. Would 26 cents for each pupil have been enough to pay for the bus?

3. How much more than enough would $.27 for each pupil have been?

Divide the following and check your work.

	a	*b*	*c*	*d*	*e*
4.	$12\overline{)\$1.68}$	$56\overline{)\$19.04}$	$45\overline{)\$11.25}$	$21\overline{)\$588}$	$76\overline{)\$608}$
5.	$89\overline{)\$13.35}$	$67\overline{)\$469}$	$77\overline{)\$18.48}$	$96\overline{)\$33.60}$	$34\overline{)\$14.62}$
6.	$42\overline{)\$10.08}$	$22\overline{)\$11.88}$	$72\overline{)\$1728}$	$53\overline{)\$12.19}$	$82\overline{)\$2214}$

LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$2\frac{1}{2}$ $+8\frac{1}{2}$	11 $-5\frac{1}{4}$	$72\overline{)1800}$	74 $\times 50$	7642 -3870
2.	$77\overline{)542}$	$6\frac{1}{8}$ $+5\frac{1}{8}$	\$.83 $\times 69$	$6\frac{5}{8}$ $-1\frac{1}{8}$	$6\overline{)1843}$
3.	$8\frac{1}{4}$ $-2\frac{3}{4}$	$92\overline{)3423}$	$9\frac{2}{3}$ $+8\frac{2}{3}$	$89\overline{)1428}$	$8\frac{1}{4}$ -5

4. Find the sum of $37.50, $150, $6.85, and $.67.

THE COST OF SAYING "HELLO" OVER A WIRE

David's class is studying about the telephone. David looked up the cost of having a telephone in the home. Here are some things he found out about rates in the city in which he lived.

1. The cost of a private telephone in the home was $3.60 a month. Counting 30 days as a month, how much was the cost of the telephone a day?

2. How much would a private telephone cost for a year?

3. If the telephone bill was paid by the fifteenth of the month, a reduction of 60 cents was allowed by the company from the regular $3.60 rate. How much would the reduced rate be? How much would this rate be a day?

4. How much would be saved in a year by making payments before the fifteenth of each month?

5. David found that on the average 90 calls a month were made on his home telephone. If the rate was $3.60 a month, how much was the cost for each call?

6. If only 60 calls were made in a month, what would be the cost of each call?

7. David found that the monthly rate on a two-party line was $2.40. How much less a day was this than the cost of a private line?

8. David told the class that the monthly rate on a four-party line was $1.80 for each telephone. How much less than the regular monthly rate for a private line was this? How much would this difference be for a whole year?

*9. Find out about local rates for telephones.

*10. What is a "pay station"?

REPAIRING LINKS IN THE DIVISION CHAIN

You know that a broken chain may be repaired by mending the broken links. If one of the links in the division chain is broken, this step or link must be fixed before the example is correct. Some of the chief things which cause the links in division to break are errors in estimating the quotient, errors in multiplication, and errors because a remainder is equal to or greater than the divisor.

In the examples given below, find the kinds of errors made. Then work the examples correctly.

1. $43\overline{)2754}$ — 68; 258x; 344; 344

2. $54\overline{)1963}$ — 18; 54x; 433; 432

3. $63\overline{)3528}$ — 67 r27; 308x; 468; 441; 27

4. $74\overline{)4529}$ — 51 r8; 370x; 82; 74; 8

5. $95\overline{)6038}$ — 61 r43; 570x; 1 38; 95; 43

6. $86\overline{)5427}$ — 51; 430x; 127; 86

7. $54\overline{)2425}$ — 42; 228x; 145

8. $65\overline{)2240}$ — 34; 195x; 290; 260

9. $84\overline{)4484}$ — 52 r6; 420x; 204; 168; 6

ARITHMETIC IN HISTORY

1. Samuel Johnson wrote the first usable English dictionary in England in 1755. How many years ago was that?

2. Noah Webster wrote the first American dictionary in 1806. How many years was this after Johnson wrote his dictionary?

3. The first alphabet invented by the Phoenicians contained only 22 letters. How many more letters are there in our alphabet?

4. Printing by movable type on a press was first used in Europe in 1440. In 1867 Sholes made the first typewriter. How many years after the first use of the printing press was the typewriter invented?

5. The telegraph was invented by Morse in 1838. The first telephone was exhibited by Bell in 1876. How many years after the invention of the telegraph was this?

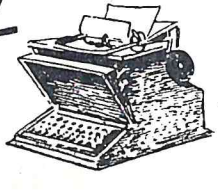
6. The paper industry was established in Bagdad as early as 795 A.D. How many years ago was this? What does A.D. mean?

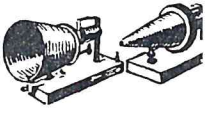
7. Before 1874 it was very difficult to send mail to other countries. The service was slow and expensive. In 1874 there was formed the Universal Postal Union to which all of the countries of the world now belong. Mail can now be sent everywhere swiftly, cheaply, and safely. How many years ago was the Postal Union formed?

8. Each year in our country our postal service carries more than one billion post cards and twenty-one billion other pieces of mail. Write these numbers with figures.

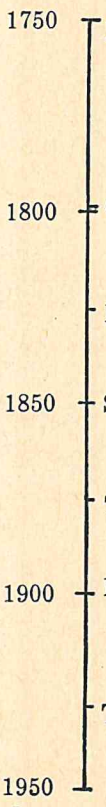
*9. Look up the story of Postal Union.

*10. Make up some arithmetic problems about the history of your state or of the United States.





A TIME LINE



The children in Miss Dale's room have made a time line showing when some of our great inventions were made. Use the time line to answer these questions. You cannot tell the years exactly but you can estimate them quite closely.

1. How many years does the time line represent?

2. Each inch in the line represents 50 years. How many inches long is the line? How long a time does $\frac{1}{2}$ inch represent? $\frac{1}{4}$ inch?

3. About what year was the lightning rod invented?

4. In about what year was the match invented?

5. What was invented in about the year 1793? in 1827?

6. About how many years after the telephone was the motion picture machine invented?

7. Which of these inventions is the most recent? Do we use it much today?

8. Make a time line like the one shown at the left, showing the time when each of the following was invented. Do this as accurately as possible.

1709—Thermometer	1868—Typewriter
1786—Steamboat	1877—Talking machine
1834—Reaper	1895—Gasoline automobile
1849—Safety pin	1905—Airplane (motor driven)

*9. Copy the time line pictured above and add radar, atomic energy, and jet planes.

THE ZERO FINAL IN DIVIDEND AND QUOTIENT

1. On an automobile trip Mr. Jones traveled in all 1,720 miles in 43 hours. How many miles an hour did he average?

$$\begin{array}{r} 40 \\ 43\overline{)1720} \\ \underline{172^{x}} \\ 0 \end{array}$$

THINK: 1720 ÷ 43 = ?
The first figure in the quotient is 4 tens.
4 × 43 = 172. Write the 172.
There is no remainder when 172 is subtracted from 172.
Bring down the 0 in 1720.
Since 0 will not contain 43, we write 0 in the quotient to show no ones.
Mr. Jones averaged 40 miles an hour.

Check:

$$\begin{array}{r} 43 \\ \times 40 \\ \hline 1720 \end{array}$$

Some of the following examples will have zero in the quotient and others will not. Check your answers by multiplication.

	a	*b*	*c*	*d*
2.	$26\overline{)780}$	$97\overline{)4850}$	$63\overline{)1460}$	$34\overline{)2380}$
3.	$65\overline{)2100}$	$78\overline{)3900}$	$86\overline{)6880}$	$43\overline{)1480}$
4.	$59\overline{)\$29.50}$	$48\overline{)\$19.20}$	$37\overline{)\$14.80}$	$98\overline{)\$58.80}$

5. Mr. Jones sold 45 pounds of butter for $9.00. How much did he receive a pound?

6. A truck contained 1200 pounds of wheat. How many bushels of wheat were there in the truck? (1 bu. = 60 lb.)

7. Last summer the Smith family drove 480 miles in 12 hours on a trip to New England. How many miles did they average an hour?

8. Lulu has a book of 360 pages. Today she read 36 pages. At that rate how long will it take her to read the book?

THREE-FIGURE QUOTIENTS

1. A grocer paid \$84.56 for 56 boxes of apples. How much did he pay a box?

```
   $1.51
56)$84.56
   56 xx
  285
  280
   56
   56
```

THINK: \$84.56 ÷ 56 = ?

You can see from the work at the left that there are three figures in the quotient. The steps in working this example are the same as in other division examples.

Notice the dollar sign and the decimal point in the answer.

He paid \$1.51 a box.

Divide, and check your answers by multiplication:

	a	*b*	*c*	*d*
2.	34)8586	41)6305	34)8298	45)6885
3.	54)\$72.90	61)7442	92)\$196.88	56)\$85.12
4.	43)\$92.02	37)\$119.14	45)\$95.85	32)\$78.40

5. The Smiths spent \$49.50 for food in November. How much did they spend on the average a day?

6. Last year the Smiths spent \$27.72 for gas for cooking. How much did they spend on the average a month for gas?

7. It takes about 32 gallons of maple sap to produce a gallon of maple syrup, or 8 pounds of maple sugar. How many gallons of maple syrup can be produced from 8,480 gallons of sap?

8. A 20-volume set of reference books cost the school board \$54.60. How much was the cost of one volume?

9. The distance from Seattle, Washington, to Hong Kong, China, is 6,952 miles. How many hours would it take a boat to go this distance at an average of 22 miles an hour?

ZERO AS A PLACE HOLDER IN DIVISION

1. Mr. Smith sold 5 pigs. They weighed 1,350 pounds. Find their average weight.

THINK: 1,350 lb. ÷ 5 = ?

$$\begin{array}{r} 270 \\ 5\overline{)1350} \\ 10\,\times\times \\ \hline 35 \\ 35 \\ \hline 0 \end{array}$$

How do we get the 10?
When we subtract 35 from 35, what is the remainder?
What number do we then bring down?
Why do we write 0 in the quotient?
Why can we call 0 a place holder here?
Check the work. 5 × 270 = ?

2. Study the examples below, then copy the examples without the work and find the answers.

$$\begin{array}{rr} & 20\text{ r}1 \\ a.\ 4\overline{)} & 81 \\ & 8\times \\ \hline & 1 \end{array} \qquad \begin{array}{rr} & 608 \\ b.\ 6\overline{)} & 3648 \\ & 36\,\times\times \\ \hline & 48 \\ & 48 \\ \hline \end{array} \qquad \begin{array}{rr} & 906\text{ r}2 \\ c.\ 3\overline{)} & 2720 \\ & 27\,\times\times \\ \hline & 20 \\ & 18 \\ \hline & 2 \end{array}$$

Divide. Check the answers in the first line of examples:

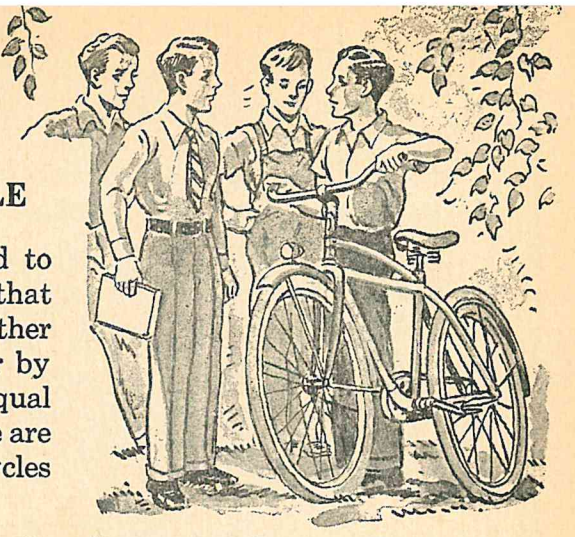
	a	*b*	*c*	*d*	*e*
3.	$6\overline{)1200}$	$7\overline{)4690}$	$5\overline{)453}$	$8\overline{)4835}$	$9\overline{)6336}$
4.	$4\overline{)361}$	$3\overline{)2721}$	$6\overline{)5280}$	$7\overline{)3504}$	$8\overline{)6400}$

PRACTICE IN DIVISION

First tell orally where the first quotient figures will be placed in these examples. Then divide.

	a	*b*	*c*	*d*
1.	$34\overline{)1782}$	$25\overline{)776}$	$63\overline{)4788}$	$55\overline{)3910}$
2.	$84\overline{)6888}$	$91\overline{)7556}$	$47\overline{)993}$	$43\overline{)2725}$
3.	$66\overline{)895}$	$65\overline{)2925}$	$38\overline{)499}$	$72\overline{)5348}$

BUYING A BICYCLE



In May, Dick wanted to buy a bicycle. He found that he could buy a bicycle either by paying cash for it or by paying for it in twenty equal monthly payments. Here are the prices of three bicycles that he could buy:

	Cash Price	20-Payment Price
Red Eagle	$18.00	$20.80
Sparkler	22.80	26.40
Sure Fire	24.30	28.00

1. How much more than the cash price was the 20-payment price of the Red Eagle? of the Sparkler? of the Sure Fire? Why is the cash price less than the 20-payment price?

2. How much would Dick have to pay a month for the Red Eagle if he bought it on the 20-payment plan?

3. What would be the monthly payment on the Sparkler? on the Sure Fire? Tell why all bicycles do not sell for the same price.

4. Dick bought the Red Eagle. He paid cash with money he had earned selling magazines. If he made 2 cents on each magazine he sold, how many magazines did he have to sell to get enough money to buy his bicycle?

5. In September, Dick saw that the Red Eagles were on sale at $16.75. How much less than the cash price in May was this?

*6. Buying things on monthly payments is called "buying on the installment plan" or "deferred payment plan." Do you think this is a good way to buy things?

ZERO NOT FINAL IN THE QUOTIENT

1. How long will it take a ship to go the 4715 miles from New York to Genoa if it averages 23 miles an hour?

$$\begin{array}{r} 205 \\ 23\overline{)4715} \\ \underline{46}\,\text{xx} \\ 115 \\ \underline{115} \end{array}$$

THINK: Divide 47 hundreds by 23. Why take 47 hundreds? What is the remainder?

BRING DOWN the 1 ten from 4715. The 1 hundred and 1 ten together make 11 tens. Since 11 tens will not contain 23, write zero in the quotient in tens' place. Here zero is a place holder.

BRING DOWN the 5 ones from 4715, making 115 ones. 115 ones $\div$ 23 = 5 ones. Write 5 in the quotient in ones' place.

TO CHECK: 205 $\times$ 23. It will take the ship 205 hours.

Some of the following examples do not have zero difficulties. Check your answers.

	a	*b*	*c*	*d*
2.	$31\overline{)25024}$	$42\overline{)17052}$	$35\overline{)14178}$	$66\overline{)39872}$
3.	$85\overline{)5100}$	$98\overline{)69193}$	$54\overline{)4914}$	$27\overline{)2943}$
4.	$73\overline{)66228}$	$21\overline{)8547}$	$57\overline{)3990}$	$72\overline{)1800}$

5. On July 12 and 13, 1937, Howard Hughes flew from Fairbanks, Alaska, to Minneapolis, Minnesota, a distance of 2,448 miles in 12 hours. How many miles did he fly an hour?

6. A certain airplane can reach a height of 15,000 feet above the earth in 6 minutes. How many feet does it rise in a minute?

7. It took Columbus 35 days to sail from the Canary Islands to the West Indies, a distance of about 3,500 miles. How many miles did Columbus sail in a day on the average?

*8. Find the speeds at which some of the big ocean liners cross the ocean.

ZEROS AND REMAINDERS IN QUOTIENTS

1. Mr. Jordan, the baker, made 491 cupcakes. How many boxes containing a dozen cakes each can he fill?

```
  40 r11
12)491
  48x
  11
```

THINK: 491 ÷ 12 = ?
Why do we write 4 in the quotient in tens' place?
How do we get the 11?
How many 12's are there in 11?
Why do we write 0 in the quotient in one's place?
He can fill 40 boxes and have 11 cakes left.

2. Study the work below carefully. Then copy the examples and work them with your book closed. Check the answers by multiplication.

```
a.   30 r10          b.   300 r7          c.   210 r15
   20)610               30)9007              32)6735
   60x                  90xx                 64xx
   10                   07                   33
                                             32
                                              15
```

Most of the examples below contain work with zeros. Divide, and check the answers by multiplication:

	a	*b*	*c*	*d*
3.	20)253	30)1523	31)650	48)965
4.	40)16000	21)8401	38)7625	96)6720
5.	14)2951	41)33647	47)6120	75)62315
6.	91)88319	24)9618	77)26951	87)35326
7.	73)66240	21)8557	45)18037	42)17094

8. A bricklayer earned $60.00 one week. He worked 40 hours. How much was he paid an hour?

WATCHING ZERO IN THE QUOTIENTS

Study the work below carefully. Be ready to tell what each step is in working the examples. Then copy and work them with your book closed. Check your answers by multiplication. Compare your work with the work on this page.

1. $24\overline{)7298}$ — 304 r2; 72 xx; 98; 96; 2

2. $46\overline{)1380}$ — 30; 138 x; 0

3. $52\overline{)22360}$ — 430; 208 xx; 156; 156; 0

4. $64\overline{)4537}$ — 70 r57; 448 x; 57

5. $75\overline{)24031}$ — 320 r31; 225 xx; 153; 150; 31

6. $95\overline{)38855}$ — 409; 380 xx; 855; 855

How can you tell when the next quotient figure in an example should be a zero? Explain why each zero was written in the examples above. Why may we call 0 a place holder in these examples?

LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$69\frac{3}{4}$ $+76\frac{1}{4}$	$64\overline{)3900}$	68 $-44\frac{1}{4}$	$48\overline{)1920}$	$94\frac{3}{4}$ $-35\frac{1}{4}$
2.	$6\overline{)12042}$	$1\frac{1}{4}$ $-\frac{3}{4}$	$57\frac{7}{8}$ $+92\frac{5}{8}$	47 $\times 69$	$36\overline{)7344}$
3.	$\frac{1}{5}$ of 735 =	$2\frac{1}{3}$ $+6\frac{1}{3}$	\$3.60 $\times 20$	$9\frac{3}{8}$ $-2\frac{5}{8}$	$5\frac{3}{8}$ $-\frac{3}{8}$

4. Add \$9.04, \$78.65, \$.98, and \$427.

CHANGING MEASURES

1. Ada is 5 feet 2 inches tall. How many inches tall is she?

THINK: We are changing from a large to a smaller unit of measure.
There are 12 inches in 1 foot.
5 ft. = 5 × 12 in. = 60 in.
5 ft. 2 in. = 60 in. + 2 in. = 62 in.

2. Tom is 5 feet 9 inches tall. How many inches tall is he?
3. Bob is 64 inches tall. He is (?) feet (?) inches tall.

THINK: 64 ÷ 12 = 5, and 4 remaining.
So 64 in. = 5 ft. 4 in.

4. Betty is 63 inches tall. She is (?) feet (?) inches tall.
5. A can of peaches weighs 1 pound 8 ounces. How many ounces does it weigh?
6. A can of pears weighs 18 ounces. It weighs (?) pounds (?) ounces.
7. Two hours and ten minutes is how many minutes?
8. Ninety minutes is (?) hour and (?) minutes.

Find the missing numbers in the following:

	a	*b*
9.	3 ft. 8 in. = ? in.	4 ft. $5\frac{1}{2}$ in. = ? in.
10.	3 gal. 3 qt. = ? qt.	2 gal. $1\frac{3}{4}$ qt. = ? qt.
11.	2 lb. 4 oz. = ? oz.	3 lb. $5\frac{1}{4}$ oz. = ? oz.
12.	3 hr. 45 min. = ? min.	5 min. 10 sec. = ? sec.
13.	4 yd. 2 ft. = ? ft.	5 yd. $1\frac{1}{2}$ ft. = ? ft.
14.	27 in. = ? ft. ? in.	39 in. = ? ft. ? in.
15.	95¢ = ? dimes ? pennies	3 dimes 4 pennies = ? ¢
16.	18 qt. = ? gal. ? qt.	31 qt. = ? gal. ? qt.
17.	19 oz. = ? lb. ? oz.	18 oz. = ? lb. ? oz.
18.	450 min. = ? hr. ? min.	400 sec. = ? min. ? sec.
19.	19 ft. = ? yd. ? ft.	26 ft. = ? yd. ? ft.
20.	3 quarters 1 dime = ? ¢	79¢ = ? quarters ? pennies

TWO ZEROS IN THE QUOTIENT

1. One day a canning factory canned 48,072 cans of peas. How many boxes, each containing 24 cans of peas, could be filled with these cans of peas?

```
  2003
24)48072
  48xxx
  ----
   072
   72
   --
```

THINK: 48072 ÷ 24 = ?
Study the work at the left carefully. Then work it on your paper. What places in the quotient do the zeros hold?
Check the answer by multiplication.
2,003 boxes could be filled.

2. Study the work below carefully. Then copy and work the examples with your book closed.

```
a. 32)128224      b. 43)259720      c. 52)364241
     4007              6040              7004 r33
   128xxx            258xxx            364xxx
   ------            ------            -------
      224               172               241
      224               172               208
      ---               ---               ---
                          0                33
```

Divide and check. Watch the zeros:

	a	*b*	*c*
3.	54)486270	68)476272	85)680340
4.	74)375180	45)138150	32)290250
5.	94)752580	84)588525	76)462106

6. The distance around the earth at the equator is about 25,000 miles. The earth rotates every 24 hours. Show by division that any spot on the earth's surface moves through space at the rate of about 1,041 miles an hour.

7. In a recent year New York City used 2,400 carloads of peanuts and cocoanuts. How many carloads was this a month?

WHEN TO DIVIDE THE REMAINDER

1. Jerry has a rope 37 feet long. He wishes to cut it into 12 equal pieces. How long should each piece be?

$$\begin{array}{r} 3\frac{1}{12} \\ 12\overline{)37} \\ \underline{36} \\ 1 \end{array}$$

THINK: 37 ft. ÷ 12 = ?
How do we get the $3\frac{1}{12}$?
Notice how $\frac{1}{12}$ is written in the quotient.
Each piece would be $3\frac{1}{12}$ ft. long.
Would there be a remainder if the whole rope was cut into 3 equal 12-foot pieces?

2. How many tickets at 20 cents each can you buy if you have 93 cents?

$$\begin{array}{r} 4 \text{ r}13 \\ 20\overline{)93} \\ \underline{80} \\ 13 \end{array}$$

THINK: 93 ÷ 20 = ?
How many tickets can you buy?
How many cents will be left?
Can you buy a ticket for 13 cents?
Can you buy part of a ticket?
Why would $4\frac{13}{20}$ not be a reasonable answer?

These two problems show that sometimes you divide the remainder by expressing it as a fraction, while at other times the remainder must not be divided.

Study the following problems. In which of them should you divide the remainder to get the correct answer? In which problems should you not divide the remainder?

3. At 4¢ each how many pencils can you buy for 10¢?

4. Mary has 9 yards of ribbon which she wishes to cut into 6 equal pieces. How long will each piece be?

5. Frank has 25 marbles to divide equally among 6 boys. Can he? How many should each boy receive?

6. Pat has gathered 39 eggs. How many dozen has he?

Whenever you have a problem to solve by division, be sure you divide the remainder if it is reasonable to do so.

*7. Make a problem in which the remainder should be divided; in which it should not be divided.

CHANGING QUOTIENTS TO SIMPLEST FORM

1. A box of 30 chickens weighed 165 pounds. Find the average weight of the chickens.

$5\frac{15}{30} = 5\frac{1}{2}$

$30\overline{)165}$

150

15

THINK: 165 lb. ÷ 30 = ?
When dividing 165 by 30 the quotient is $5\frac{15}{30}$.
Reduce $\frac{15}{30}$ to lowest terms. $\frac{15}{30} = \frac{1}{2}$.
Therefore $5\frac{15}{30} = 5\frac{1}{2}$
The average weight was $5\frac{1}{2}$ pounds.

In many division examples there are remainders which can be expressed as fractions in the quotient. Always reduce them to lowest terms.

2. How can you tell if a fraction is in lowest terms?

3. A grocer sold a 20-pound sack of sugar for $1.15. How much was the price a pound?

Reduce these fractions to lowest terms:

4. $\frac{12}{24}$ $\frac{16}{32}$ $\frac{15}{20}$ $\frac{14}{21}$ $\frac{18}{30}$ $\frac{32}{40}$ $\frac{25}{30}$ $\frac{24}{32}$

5. $\frac{16}{36}$ $\frac{14}{28}$ $\frac{32}{64}$ $\frac{48}{72}$ $\frac{40}{48}$ $\frac{27}{81}$ $\frac{32}{96}$ $\frac{48}{64}$

Divide. Express the remainders as fractions and reduce to lowest terms:

	a	*b*	*c*	*d*	*e*
6.	$21\overline{)66}$	$20\overline{)85}$	$30\overline{)75}$	$40\overline{)90}$	$60\overline{)96}$
7.	$24\overline{)99}$	$32\overline{)104}$	$52\overline{)130}$	$50\overline{)275}$	$48\overline{)156}$
8.	$22\overline{)297}$	$12\overline{)148}$	$24\overline{)776}$	$36\overline{)798}$	$40\overline{)2540}$
9.	$75\overline{)3175}$	$36\overline{)1488}$	$92\overline{)3427}$	$64\overline{)2256}$	$45\overline{)2394}$

10. An airplane flew 270 miles in 60 minutes. How many miles did it fly in one minute?

11. Show that the answers of the following pairs of examples are the same:

a. $30\overline{)97}$ and $\frac{97}{30}$. *b.* $\frac{126}{42}$ and $42\overline{)126}$. *c.* $\frac{280}{50}$ and $50\overline{)280}$

DIAGNOSTIC TEST IN DIVISION

Work these examples carefully. If you work more than one example in a row incorrectly, study again the page given at the right of the row which explains how to work the example. Before you take the test below, it would be a good plan to work at least the first example in each row in the diagnostic test on page 154.

Part I

	a	*b*	*c*	*d*	
1.	$30\overline{)660}$	$20\overline{)480}$	$21\overline{)483}$	$42\overline{)462}$	(205)
2.	$25\overline{)575}$	$35\overline{)735}$	$36\overline{)792}$	$23\overline{)989}$	(205)
3.	$55\overline{)605}$	$43\overline{)516}$	$22\overline{)308}$	$33\overline{)429}$	(205)
4.	$31\overline{)345}$	$12\overline{)389}$	$11\overline{)367}$	$23\overline{)492}$	(208)

Part II

1.	$32\overline{)407}$	$23\overline{)512}$	$24\overline{)750}$	$23\overline{)721}$	(208)
2.	$71\overline{)3053}$	$82\overline{)4264}$	$45\overline{)2385}$	$33\overline{)1386}$	(211)
3.	$92\overline{)3188}$	$45\overline{)2390}$	$64\overline{)2250}$	$76\overline{)3220}$	(211)
4.	$12\overline{)\$1.56}$	$32\overline{)\$8.00}$	$96\overline{)\$32.64}$	$82\overline{)\$22.96}$	(213)

Part III

1.	$34\overline{)8264}$	$25\overline{)2775}$	$56\overline{)8568}$	$92\overline{)19780}$	(219)
2.	$44\overline{)2200}$	$74\overline{)4440}$	$86\overline{)5160}$	$65\overline{)5200}$	(218)
3.	$94\overline{)38164}$	$85\overline{)34510}$	$31\overline{)25055}$	$90\overline{)81610}$	(222)
4.	$20\overline{)813}$	$40\overline{)1627}$	$42\overline{)29417}$	$57\overline{)17141}$	(223)

For extra practice later on, turn back to this test and work the first column of examples. On another day work the second column of examples, and so on. This will help you to review the important kinds of examples in division.

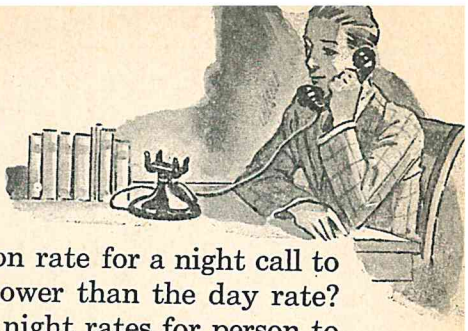
"LONG-DISTANCE CALLING"

The class is studying the uses of the telephone. Alice looked up the cost of long-distance telephone calls by day and by night and made a report to the class. She wrote the table given below on the blackboard. It gives the day and night rates for 3-minute calls to a number of places near the city in which she lives.

	Station to Station		Person to Person	
	Day	Night	Day	Night
A-Town	$.45	$.35	$.65	$.55
B-Town	.55	.35	.80	.60
C-Town	.75	.45	1.05	.75
X-Town	1.20	.75	1.60	1.15
Y-Town	2.10	1.30	2.80	2.00
Z-Town	2.50	1.50	3.25	2.25

"Station to station" calls are those in which you ask to talk to anyone who may answer the telephone. "Person to person" calls are those in which you ask to talk to some particular person. Day rates are for calls between 4:30 A.M. and 7:00 P.M.

1. What is the day rate for a station to station call to A-Town? What is the night rate? Which is less, the day rate or the night rate? How much? Is the difference between day and night rates for station to station calls the same for rates to B-Town? to C-Town? to the other towns?



2. What is the person to person rate for a night call to X-Town? Is this rate higher or lower than the day rate? How much is the difference? Are night rates for person to person calls lower or higher than day rates for all of the places in the table?

3. Which costs more to B-Town, a day station to station call, or a day person to person call? How much more? Why are the charges different?

4. Which costs more to X-Town, a night station to station call or a night person to person call? How much?

5. Suppose that Alice wanted to telephone to her grandmother in A-Town. What would be the cheapest call she could make? How much would the charges be?

6. One noon Alice's father wished to telephone to Mr. Smith in X-Town. How much would such a call to Mr. Smith cost if it lasted less than 3 minutes?

7. Alice's brother is in college in Z-Town. He telephoned to Alice's home at 8 o'clock on the evening of her birthday. How much did the call cost? How much more would the call have cost if he had telephoned at noon instead of at night?

8. In a recent year the cost of telephoning from Minneapolis to Paris, France, was $23.25 for day calls and $16.50 for night calls. Find the difference. You may be interested in finding the rates on telephoning to other foreign countries.

*9. Someone in the class may find the rates for telephone calls to some place and report them to the class.

*10. It is possible to telephone from shore to ships in the ocean. Find out about the cost of this service.

HOW WELL CAN YOU WORK DIVISION EXAMPLES?

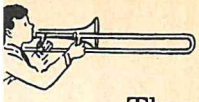
If you can work correctly all of the examples in the test below, you have learned very well the steps in dividing by a two-figure number. Do not be satisfied until you can work every example in the test correctly.

1. $12\overline{)288}$
2. $24\overline{)768}$
3. $33\overline{)726}$
4. $71\overline{)2892}$
5. $62\overline{)3560}$
6. $96\overline{)\$50.88}$
7. $56\overline{)8512}$
8. $45\overline{)2700}$
9. $84\overline{)59136}$
10. $67\overline{)4029}$
11. $98\overline{)68671}$
12. $76\overline{)61200}$

INFORMATION PLEASE!

Be ready to show that your answers are correct.

1. Which is the cheapest way to travel, by bus, by train, or by airplane? Which way is quickest?
2. Where are oranges cheaper, in California or in Minnesota? Why are the prices of all oranges not the same?
3. Why is a time line a good way to show when different events in history happened?
4. A pupil made this problem: "If the wool of a sheep weighs 31 pounds, how much does the wool of 8 sheep weigh?" Is there anything wrong with this problem?
5. Do all people pay the same rates for their telephones? What are the rates where you live?
6. When are the rates we pay for long-distance telephone calls higher, in the morning at 10 o'clock or at night at 10 o'clock?
7. When is the price less, when cash is paid for something or when we pay for it in 20 monthly payments?



LET'S PRACTICE

These sets of examples contain the kinds of examples you have learned to work. Work them one set a day on two days. Be sure to copy the numbers correctly. A good way to get more practice is to work the same set of examples on three days to see how your work improves.

Set I

1. $\begin{array}{r} 847 \\ 986 \\ 643 \\ 795 \\ 776 \\ \underline{839} \end{array}$

2. Reduce $\frac{16}{32}$

3. $\begin{array}{r} 96 \\ \times 50 \end{array}$

4. $\begin{array}{r} 8\frac{1}{4} \\ -3 \end{array}$

5. $58\overline{)2417}$

6. $\begin{array}{r} 7\frac{1}{4} \\ +5\frac{1}{4} \end{array}$

7. $4 \div 8 = ?$

8. $\begin{array}{r} 6\frac{2}{3} \\ -5\frac{1}{3} \end{array}$

9. $\frac{1}{3}$ of $84 =$

10. $92\overline{)3434}$

Set II

1. $\begin{array}{r} 266 \\ 38 \\ 6975 \\ 647 \\ 6 \\ \underline{995} \end{array}$

2. Reduce $\frac{16}{24}$

3. $\begin{array}{r} 68 \\ \times 73 \end{array}$

4. $\begin{array}{r} 6\frac{1}{2} \\ -\frac{1}{2} \end{array}$

5. $56\overline{)16800}$

6. $\frac{1}{4}$ of $172 =$

7. $10 \div 4 = ?$

8. $\begin{array}{r} 45 \\ -32\frac{1}{4} \end{array}$

9. $\begin{array}{r} 6\frac{3}{4} \\ +4\frac{3}{4} \end{array}$

10. $77\overline{)\$48.51}$

USING THE VOCABULARY OF ARITHMETIC

Give the names of several ways of measuring that are used by each of the following workers:

grocer	carpenter	doctor	florist
garageman	dairyman	druggist	teacher
cook	seamstress	baker	butcher
farmer	chauffeur	weatherman	aviator

HOW WELL DO YOU REMEMBER?

1. Which of these is a mixed number? an improper fraction?

$$27 \qquad 16\tfrac{1}{2} \qquad \tfrac{3}{4} \qquad \tfrac{7}{4} \qquad 0$$

2. Write a fraction having a numerator 3 and a denominator 5. What kind of fraction is it?

3. Is $\frac{9}{10}$ reduced to lowest terms? How can you tell?

4. How do you find the quotient 5 in the example at the right?

5. Show how multiplication, addition, and subtraction were used in working the example in the box.

$$\begin{array}{r} 5 \text{ r}8 \\ 46\overline{)238} \\ \underline{230} \\ 8 \end{array}$$

6. How do you check the example? Show that the quotient is correct.

7. Give reasons why an example in division may not check.

8. Tell how to find the first figure in the quotient of each of these examples. Above what number will you write it?

a. $24\overline{)736}$ *b.* $54\overline{)2798}$ *c.* $87\overline{)7954}$

Divide 36,493 by 60 and check your answer.

9. How can you tell when to write 0 in the quotient of an example?

10. What are some of the kinds of errors boys and girls make in division?

11. Divide \$4.00 by 20. Will the answer be 20, \$.20, or \$20?

12. How many hours and minutes are there in 150 minutes?

13. Show that 150 minutes is the same as $2\frac{1}{2}$ hours.

14. How do you change 3 gal. 2 qt. to quarts? to gallons?

15. Give each step in working the example $8\frac{3}{4} + 6\frac{3}{4}$.

16. Give each step in working the example $9\frac{1}{4} - 4\frac{3}{4}$.

MEASURING GROWTH IN PROBLEM SOLVING

1. Joe earned $4.70. He spent $1.65. How much did he have left?

2. Find the cost of 9 pounds of butter at 36 cents a pound.

3. If two tickets for a movie cost 70 cents, how much does one ticket cost?

4. A bushel of wheat weighs 60 pounds. How much does $\frac{1}{4}$ bushel weigh?

5. School desks cost about $6.95 each. How much do 40 desks cost?

6. Daniel and Frank received $3.50 for old paper and scrap iron that they sold. They shared the money equally. Frank spent 45 cents for a game. How much money did he have left?

7. An ocean liner goes 3,784 miles in making the trip from New York to France. How many hours does it take to make the trip if the liner averages 22 miles an hour?

8. Jean picked 18 dozen sweet peas. She gave her mother a bouquet of 3 dozen sweet peas and sold the rest of the flowers in bunches of a dozen flowers each for 10 cents a bunch. How much did she receive for the flowers she sold?

9. George has a board 10 feet long. He wishes to cut it into four equal parts. How long should each of the parts be?

10. Mary needs $4\frac{3}{4}$ yards of cloth for a dress. She has two pieces of cloth, one $1\frac{1}{4}$ yards long, the other 2 yards long. How much more cloth does she need?

What Your Score Means

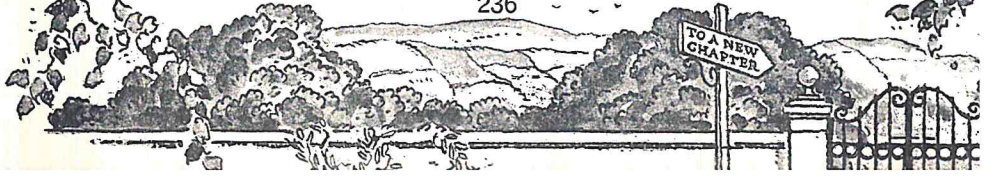
Unsatisfactory	Fair	Good	Excellent
0 1 2 3 4	5 6	7 8	9 10

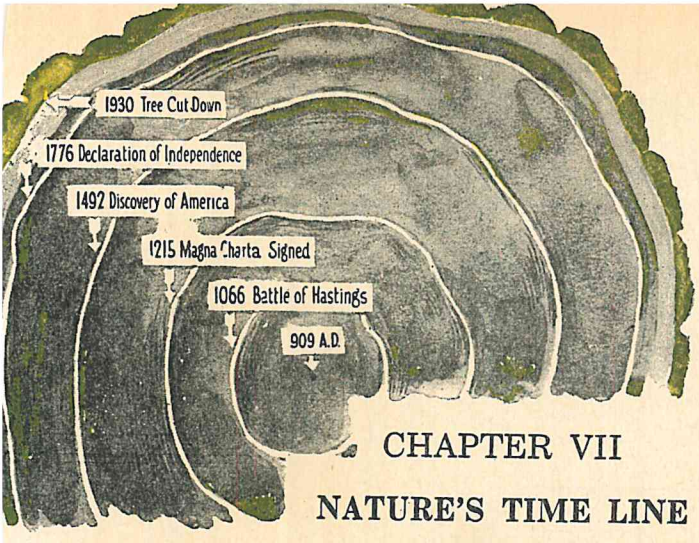
OPENING THE GATE TO THE NEW CHAPTER

Use this test to find how well you have learned the arithmetic you have studied. Try to have every answer correct.

1. Find the sum of \$37.65, \$9.78, \$9.59, and \$.69. (14)
2. Subtract \$38.74 from \$120. (17)
3. Multiply 78 by 60. (49)
4. Find the product of 39 $\times$ \$4.85. (70)
5. Find $\frac{1}{4}$ of 76. (29)
6. Divide 3256 by 8. Check your work. (33)
7. Reduce to lowest terms: $\frac{6}{8}$, $\frac{10}{12}$, $\frac{5}{10}$. (94)
8. Express in simplest form: $5\frac{2}{4}$, $6\frac{4}{3}$, $7\frac{2}{2}$. (94)
9. Add these mixed numbers: $6\frac{3}{4} + 9\frac{3}{4}$. (168)
10. Find the sum of $8\frac{1}{2} + 5\frac{1}{2}$. (168)
11. Subtract $4\frac{1}{4}$ from $5\frac{3}{4}$. (114)
12. Find the difference between $6\frac{1}{3}$ and $9\frac{1}{3}$. (116)
13. How much less than 6 is $4\frac{1}{4}$? (183)
14. Subtract: $6\frac{1}{4} - 3\frac{3}{4} = ?$ (189)
15. Divide and check: $45\overline{)319}$. (204)
16. Divide and check: $68\overline{)970}$. (208)
17. How much is 1779 $\div$ 34? (211)
18. Divide 4250 by 85. Check the answer. (218)
19. Divide 56682 by 94. (222)
20. Divide 39223 by 56. (223)

After your paper has been marked, correct your work at once. If you have difficulty, turn for help to the pages given at the right. Be sure that you can work every example easily and correctly.





CHAPTER VII

NATURE'S TIME LINE

The picture above shows you one of nature's most interesting ways of keeping a record of time. It is a section of a log showing the **annual rings**. What does "annual" mean? By counting the annual rings, we can find the age of the tree. Some of the sequoias of California, the largest trees in the world, have ring counts of over 4000 years. (See the picture.) The rings are not of equal thickness, showing that the tree did not always grow at the same rate. This is because in dry years when there is little rain, trees do not grow as much as they do in years when there is much rain.

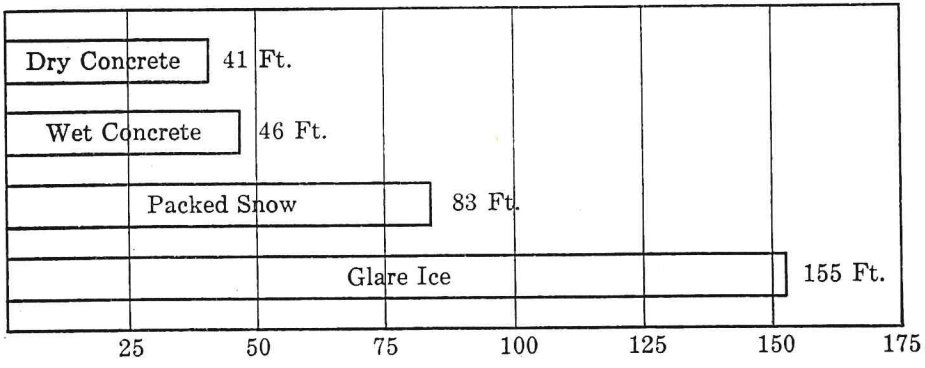
1. In what year did the tree in the picture begin to grow?
2. How long before the discovery of America was this?
3. How old was the tree when the Declaration of Independence was signed? What is the Declaration of Independence?
4. How old was the tree when it was cut down? How many annual rings did the tree have?
5. About how many centuries did the tree stand?

*6. Perhaps you can find a log and tell the age of the tree from which the log was cut.

*STOPPING THE AUTOMOBILE

This graph shows the stopping distance on different road surfaces for an automobile going 20 miles an hour.

Stopping Distances on Different Road Surfaces



1. What is the stopping distance of a car on dry concrete? on packed snow with no chains? on glare ice with no chains?

2. How much more is the stopping distance on glare ice than on dry concrete?

3. Chains on all four wheels reduce the stopping distance on glare ice to about $\frac{1}{2}$ of the distance. What is the stopping distance of a car with chains on glare ice?

4. When the street is packed snow or glare ice, tell why it is safer to wait until the traffic has come to a complete stop before you cross the street. What does skidding mean?

5. Make up four good questions using the information given in the graph.

*6. Make up safety problems about the "danger story" this graph tells.

KNITTING A SWEATER

Andrea is knitting a sweater for her father's birthday gift.

1. The kind of yarn she needs is sold in skeins weighing $\frac{1}{2}$ ounce, 2 ounces, and 4 ounces. What part of a pound is 2 ounces? 4 ounces?

2. A 2-ounce skein has about 140 yards of yarn in it. How many yards of yarn are there in a 4-ounce skein?

3. A 2-ounce skein costs 29 cents. A 4-ounce skein costs 53 cents. How much does Andrea save if she buys 4 ounces of wool in one 4-ounce skein instead of in two 2-ounce skeins?

4. If a 2-ounce skein costs 29 cents, how much does a pound of yarn cost, bought in 2-ounce skeins?

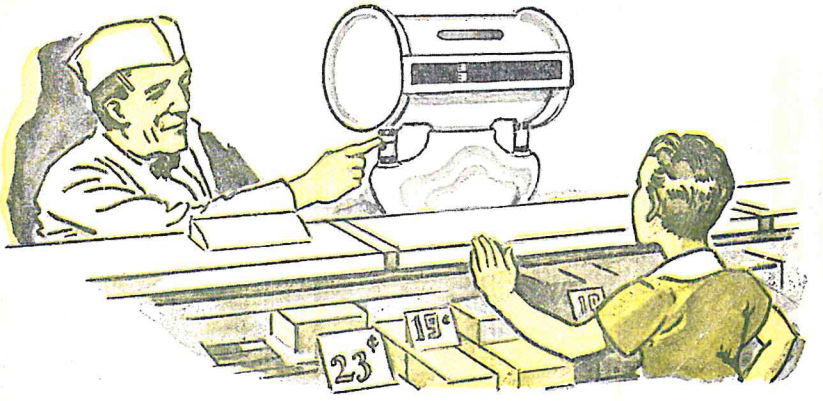
5. How much does a pound of yarn cost if bought in 4-ounce skeins at 53 cents each?

6. A $\frac{1}{2}$ ounce skein costs 9 cents. How much is that an ounce? How much more does a pound of yarn cost bought in $\frac{1}{2}$-ounce skeins than a pound bought in 4-ounce skeins?

7. Andrea's sweater, when finished, will weigh 1 pound 4 ounces. How many 2-ounce skeins does she need? How many 4-ounce skeins?

8. How much will she save if she buys the yarn in 4-ounce skeins instead of in 2-ounce skeins?

*9. Find the cost at local stores of yarn and knitting needles that would be needed to knit a $1\frac{1}{2}$-pound sweater.



Why is the grocer showing David the government inspection seal?

Why is Mary reading the weight on the label of the can?

HOW SHALL WE MEASURE FRUIT AND VEGETABLES?

In a recent year one of our states passed a law that vegetables and fruit should be sold either by count or by weight. It was forbidden to sell vegetables by the bushel or by the peck because these two measures are not always accurate.

1. A buyer saw two bushel baskets containing the same kind of apples. The buyer weighed the apples. One basket weighed $44\frac{3}{4}$ pounds, the other weighed $48\frac{1}{4}$ pounds. Find the difference in their weights. Can you give any reasons for the difference in the weights?

2. In a truck there were 2400 pounds of potatoes. There are 60 pounds of potatoes to the bushel. How many bushels of potatoes were there in the truck? Which do you think is the better way to find the number of bushels in the truck, to use a bushel basket, or to divide the weight of the potatoes by 60? Tell why.

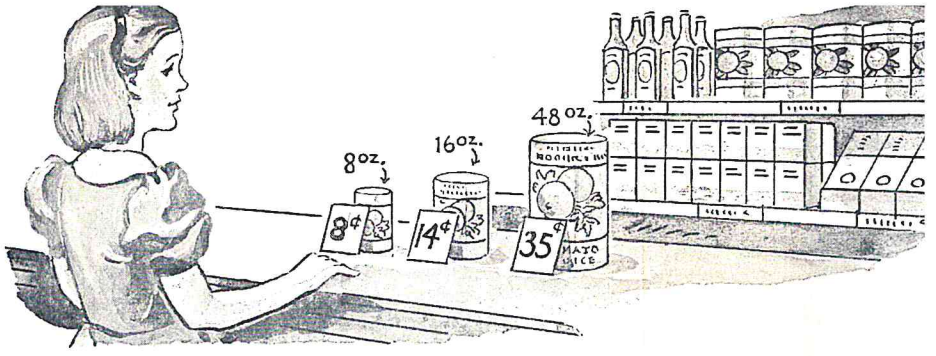
3. Eggs are sold by the dozen. Eggs are usually sorted according to size, and the highest price is charged for the largest eggs. Some people think that eggs should be sold by weight. Do you think that this would be a good plan? Why?

4. Bananas differ considerably in size. They are sold both by the pound and by the dozen. Which do you think is the better plan? Why? Find out about how many bananas there are in a pound.

5. Which of these following can most conveniently be sold by counting them? by weighing them? by the box?

strawberries, oranges, grapes, carrots, peanuts, head lettuce, melons, peas, radishes, apples.

*6. Find what is meant by "shrinkage."



TOMATO JUICE FOR BREAKFAST

Ann went to the store to buy tomato juice. She saw these three cans of different sizes, all of the same brand.

1. How much did the smallest can weigh? the middle-sized can? the largest can?

2. How much would two 8-ounce cans cost?

3. Which would be cheaper, two 8-ounce cans or one 16-ounce can? How much cheaper?

4. How many times as much as an 8-ounce can does a 48-ounce can hold?

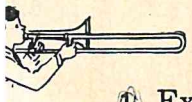
5. Which would be cheaper, six 8-ounce cans or one 48-ounce can? How much cheaper?

6. Ann saw a very pretty glass bottle containing 4 ounces of tomato juice. The price was 10 cents a bottle. How much more would 8 ounces of tomato juice in bottles cost than in an 8-ounce can? Why might people buy tomato juice in such a bottle when the price is so much higher?

7. Ann has 4 ounces of tomato juice for breakfast. How many meals can she get from an 8-ounce can? a 16-ounce can? a 48-ounce can?

8. Find the cost a meal for tomato juice when sold in cans of each size. For which size is the cost least?

*9. What is the cheapest way in which to buy tomato juice? See if this is true of orange juice and other kinds of juices.



LET'S PRACTICE

1. Express in simplest form:

$\frac{6}{8}$ $\quad 3\frac{2}{4}$ $\quad \frac{5}{4}$ $\quad 7\frac{2}{2}$ $\quad 8\frac{6}{4}$ $\quad 9\frac{8}{8}$

2. What are the missing numerators?

$1\frac{1}{4} = \frac{?}{4}$ $\quad 5\frac{1}{4} = 4\frac{?}{4}$ $\quad 6\frac{2}{3} = 5\frac{?}{3}$

3. Show that the work in each of the examples below is correct.

a. $3\frac{3}{4} + 4\frac{1}{4} = 7\frac{4}{4} = 7 + 1 = 8$

b. $6\frac{3}{4} + 7\frac{3}{4} = 13\frac{6}{4} = 13 + 1\frac{1}{2} = 14\frac{1}{2}$

c. $6\frac{1}{4} - 2\frac{3}{4} = 3\frac{2}{4} = 3\frac{1}{2}$

Find the answers:

	a	*b*	*c*	*d*	*e*	*f*
4.	$4\frac{1}{4} + 3\frac{1}{4}$	$5\frac{1}{2} + 6\frac{1}{2}$	$7\frac{1}{3} + 8\frac{1}{3}$	$9\frac{3}{4} + 7\frac{1}{4}$	$6\frac{5}{8} + 7\frac{7}{8}$	$9\frac{3}{4} + 12\frac{3}{4}$
5.	$5\frac{1}{2} - 3$	$6\frac{3}{4} - 5\frac{1}{4}$	$8 - 3\frac{1}{2}$	$5\frac{1}{4} - \frac{1}{4}$	$6\frac{1}{3} - 5\frac{2}{3}$	$9\frac{1}{4} - 7\frac{3}{4}$

CHECKING UP ON DIVISION

1.
$$\begin{array}{r} 608 \\ 54\overline{)32832} \\ 324 \\ \hline 432 \\ 432 \\ \hline \end{array}$$

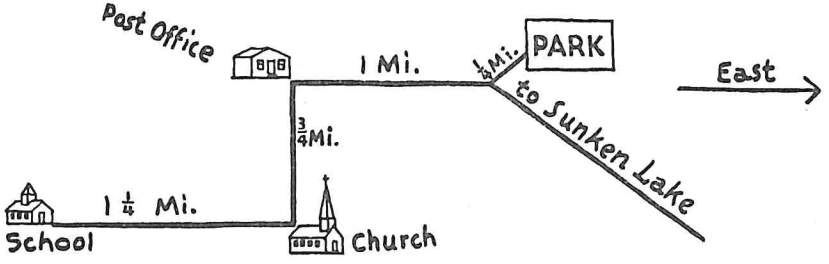
How do we get the 6?
Why do we put 0 in the quotient?
How do we get the 8 in the quotient?
How do we check the answer?

Divide. Express the quotient with a remainder in the first two rows and with a fraction in the last two rows.

	a	*b*	*c*	*d*
2.	$54\overline{)4489}$	$20\overline{)4113}$	$65\overline{)5280}$	$47\overline{)1599}$
3.	$95\overline{)6037}$	$42\overline{)3497}$	$32\overline{)6745}$	$86\overline{)5430}$
4.	$20\overline{)9645}$	$32\overline{)1736}$	$50\overline{)26375}$	$40\overline{)1100}$
5.	$64\overline{)3592}$	$21\overline{)8519}$	$30\overline{)9765}$	$80\overline{)71160}$

FINDING THE WAY TO THE PICNIC

The children of the Lee School are going on a picnic. This map was drawn by Fred to show them how to get to the park where the picnic was to be held.



1. How far was it from the school to the church? from the church to the post office? from the post office to the road to Sunken Lake?

2. How far was it from the school to the post office? What is there on the map that helps the children to know where to turn?

3. How far was it from the post office to the park?

4. How far was it from the school to the park? Name some place about that distance from your school.

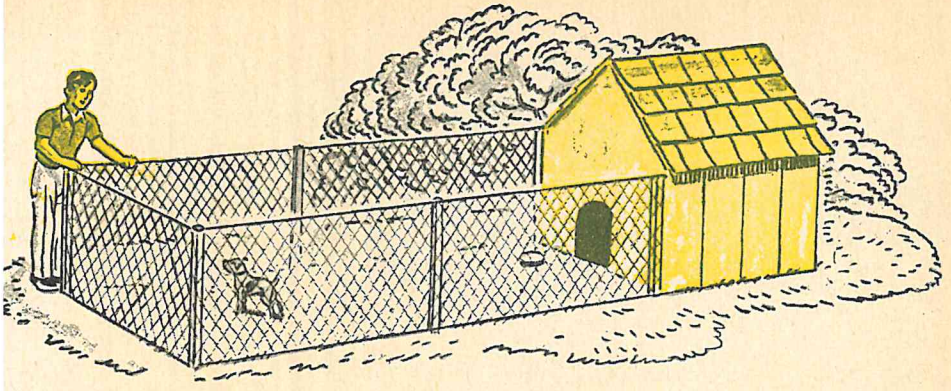
5. Which is farther, from the school to the post office or from the post office to the park? How much farther?

6. In what direction did the children walk in going from the school to the church? from the church to the post office? from the post office to the Sunken Lake road? from the Sunken Lake road to the park?

7. Dick lives next to the church. About how far is it from the park to his home?

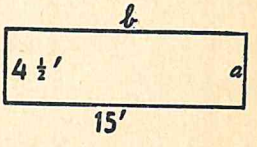
*8. Draw a map like Fred's showing how to get to some interesting place that your class might like to visit.

*9. To what scale is Fred's map drawn?



A RECTANGLE FOR THE PUPPY

James is planning a yard for his puppy. This is the drawing he made for the yard.



1. How wide will the yard be?
2. How long will the yard be?

Any surface with four sides and four square corners is called a **rectangle.**

3. Will the puppy yard be a rectangle or a square? How can you tell?

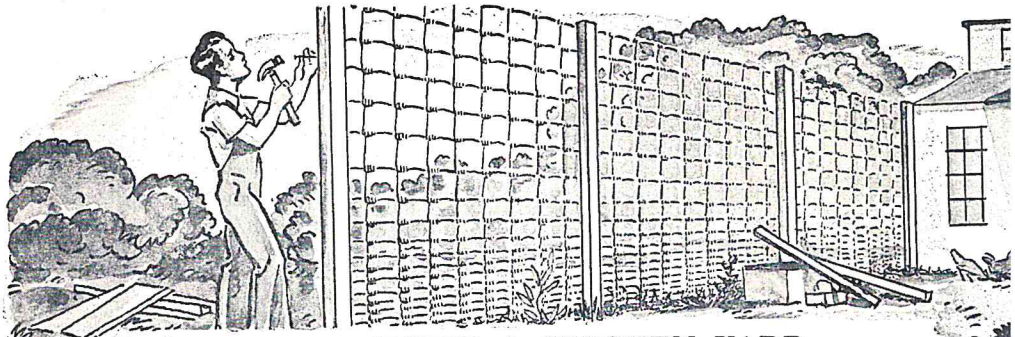
The length and width of any surface such as a rectangle are called its **dimensions.**

4. What are the dimensions of the yard James will make?
5. What is the length of side *a*? of side *b*?
6. What is the distance around all four sides?

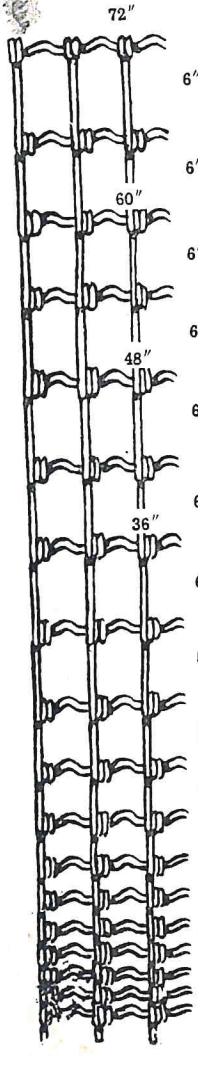
We call the distance around a surface its **perimeter.**

When it is completed, his pen will look like the picture at the top of this page.

7. If the posts are set midway along the sides, what is the distance from the midposts to the doghouse? to the end of the pen?
8. Wire costs about 5 cents a foot. How much will James pay for enough wire to fence his puppy yard?



FENCING A CHICKEN YARD



Norbert has a chicken yard 35 feet long and 40 feet wide for which he wishes to buy some new wire fence like that in the picture. In a catalog he found that the kind of wire he wants costs \$3.60, or $2\frac{2}{5}$ cents a foot, for a 150-foot roll. The price is 3 cents a foot if less than a 150-foot roll is bought.

1. Make a drawing showing the dimensions of the chicken yard.

2. Find the distance around the chicken yard. What is another word we use for "distance around"?

3. Does Norbert need more than one roll of wire?

4. If Norbert bought the wire at 3 cents a foot, how much more would he have to pay a foot for the wire than if he bought a whole roll of wire? Why is the price for a foot of wire less when buying by the roll than when buying less than a roll?

5. What is the height of the chicken wire in the picture? Express the height in feet; in yards.

6. How far apart are the two top wires?

7. What can you say about the distance between the wires the nearer they are to the ground? How wide is the narrowest space? How much less is this distance than that between the two top wires?

*8. Why are the spaces between the wires so narrow at the bottom?

MEASURED AND COUNTED NUMBERS

When we say that there are 40 pupils in a class, we mean that the class consists of exactly 40 pupils, no more and no less. Here 40 is a **"counted"** or "exact" number.

When we say that a boy weighs 40 pounds, we mean that he weighs **about** that much. He may weigh a few ounces more or a few ounces less than 40 pounds. In the same way when we say that it takes 10 minutes to walk to school, or that a man is 6 feet tall, we do not mean exactly these amounts, because we know that we cannot measure them exactly. We call numbers like 40 pounds, 10 minutes, and 6 feet **"measured"** or "approximate" numbers.

1. Show by drawing two lines side by side with a ruler that it is almost impossible to draw a line exactly $3\frac{3}{4}$ inches long. Why is this true?

2. Count the number of boys in your classroom. Why can we say that this number is exact?

3. Is $\frac{1}{2}$ pound of butter an exact measurement? Why?

4. Is $\frac{1}{2}$ dozen eggs an exact or an approximate number of eggs? Why?

5. In the following list there are some exact and some approximate numbers. Be ready to tell how you can show what kind of number each one is:

a. 20 books
b. 4 quarts of milk
c. 12 hours
d. $1.45
e. 5 miles
f. 3 cups of water
g. $4\frac{1}{2}$ pounds of butter
h. 3 dozen bananas
i. $\frac{1}{2}$ yard of cloth
j. 25 pennies
k. 31 days
l. 10 sacks of sugar

*6. When we say that there are 130,000,000 people in the United States, is this number exact or approximate? Why do you think so?

ADDING UNITS OF MEASURE

1. Alice has two pieces of ribbon, one 5 feet 4 inches long, and the other 4 feet 3 inches long. How many feet of ribbon has she? 5 ft. 4 in. are written 5′ 4″.

THINK: 5′4″ + 4′3″ = ?

$5'4'' = 5\frac{4}{12}'$
$4'3'' = 4\frac{3}{12}'$
$9\frac{7}{12}'$

One way to find the sum is to change the inches to fractions of a foot as shown at the left and then to add.

Mary has $9\frac{7}{12}'$ of ribbon.

2. Another way to find the sum is first to add the inches.

5′4″	4″ + 3″ = 7″. Write 7″.
4′3″	Then add the feet. 5′ + 4′ = 9′. Write 9′.
9′7″	Show that 9′7″ = $9\frac{7}{12}'$.

3. Show that the following additions are correct:

a.

4 gal. 1 qt.	$= 4\frac{1}{4}$ gal.
3 gal. 2 qt.	$= 3\frac{2}{4}$ gal.
7 gal. 3 qt.	$= 7\frac{3}{4}$ gal.

b.

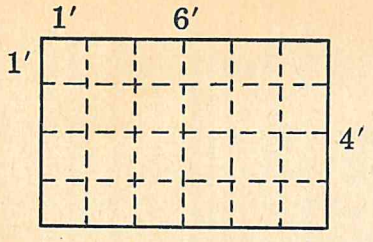
5 hr. 20 min.	$= 5\frac{20}{60}$ hr.
3 hr. 15 min.	$= 3\frac{15}{60}$ hr.
8 hr. 35 min.	$= 8\frac{35}{60}$ hr. $= 8\frac{7}{12}$ hr.

4. On an automobile trip John rode 4 hours 30 minutes in the morning and 3 hours 20 minutes in the afternoon. How long did he ride in all? Find the answer in the two ways shown above.

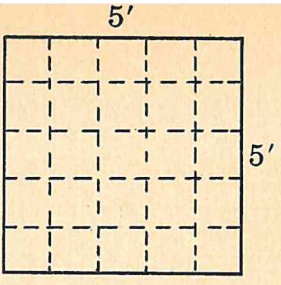
5. Arthur's mother bought two cans of peaches. One can weighed 1 pound 4 ounces, the other weighed 1 pound 10 ounces. How much did the two cans of peaches weigh? Find the answer in two ways.

Find the sums in the two ways shown above:

6. 6 ft. 7 in. + 5 ft. 4 in. = ?
7. 3 hr. 15 min. + 8 hr. 30 min. = ?
8. 4 gal. 1 qt. + 3 gal. 1 qt. = ?
9. 8 yd. 1 ft. + 4 yd. 1 ft. = ?
10. 4 lb. 6 oz. + 4 lb. 8 oz. = ?
11. 6 min. 5 sec. + 7 min. 2 sec. = ?



Part A



Part B

MEASURING THE SIZE OF SCHOOL GARDENS

Jane has the choice between two parts of the school garden pictured above. She may have the larger part. Which part do you think is larger? Is there any way in which you can show that one part is larger than the other?

1. How do the perimeters of the two parts compare?

2. The dotted lines in each part divide it into squares each of whose sides is 1 foot long. You can see that in Part A there are six squares in a row. How many rows of squares are there? How many squares are there in Part A?

We say that Part A has an **area** of 24 **square feet.** Just as we measure length by the foot, we measure area by the **square foot.**

3. On the blackboard draw a square 1 foot long and 1 foot wide. Write in it: 1 sq. ft.

4. How many squares are there in one row in Part B? How many rows of squares are there? What is the area of Part B?

5. Which is larger, Part A or Part B? How much larger?

*6. Which would be larger, a part of the garden 6 feet long and 3 feet wide, or a part 5 feet long and 4 feet wide? Make drawings like these shown above to find out. Let 1 inch stand for 1 foot in your drawings.

*7. Which is nearest in size to a square foot: a postage stamp, a page of this book, or the top of your desk?

*MISSING NUMBERS IN MAGIC SQUARES

9	$2\frac{1}{2}$	2	$7\frac{1}{2}$
?	6	$6\frac{1}{2}$	5
$5\frac{1}{2}$	?	$4\frac{1}{2}$	7
3	$8\frac{1}{2}$	8	?

1. Look at the square at the left. If you add the numbers in the first line you can tell what the sum of the numbers in each line and row must be. To find the missing number in any line or row, add the other numbers that are given in the line or row. Then subtract their sum from the number that is the sum of the numbers in a complete line or row. The result is the missing number. Copy the given numbers in a square. Then find the missing numbers and write them in your square. See if your square is a magic square.

2. Copy the squares below. Find the missing numbers. Then add to find if your squares are magic squares.

?	4	6	$\frac{1}{2}$
1	$5\frac{1}{2}$	$3\frac{1}{2}$	7
$1\frac{1}{2}$	5	?	$7\frac{1}{2}$
8	$2\frac{1}{2}$	$4\frac{1}{2}$	?

$4\frac{1}{3}$	?	4	$\frac{1}{3}$
$\frac{2}{3}$	$3\frac{2}{3}$	$2\frac{1}{3}$	?
1	$3\frac{1}{3}$	2	?
?	$1\frac{2}{3}$	3	$1\frac{1}{3}$

6	$1\frac{2}{3}$	$1\frac{1}{3}$	5
$2\frac{1}{3}$	4	$4\frac{1}{3}$	$3\frac{1}{3}$
$3\frac{2}{3}$	$2\frac{2}{3}$	3	$4\frac{2}{3}$
2	$5\frac{2}{3}$	$5\frac{1}{3}$	1

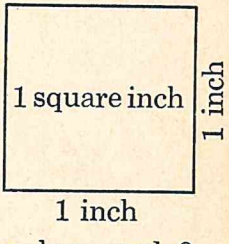
3. Make a new magic square, using the square at the left. Subtract $\frac{1}{3}$ from each number in the square. Write the numbers you get in the cells of a square drawn on your paper. Then add the numbers in your square to see if it is a magic square.

MEASURING THE SIZE OF A PICTURE

1. What are the dimensions of this picture?

2. On your paper draw a rectangle having the same dimensions as the picture. Divide the rectangle into inch squares as shown at the right. How many squares are there in each row? How many rows are there in all? How many squares are there in all?

A square, each of whose sides is 1 inch long, has an area of **1 square inch.**



3. Which is larger, a square foot or 1 square inch?

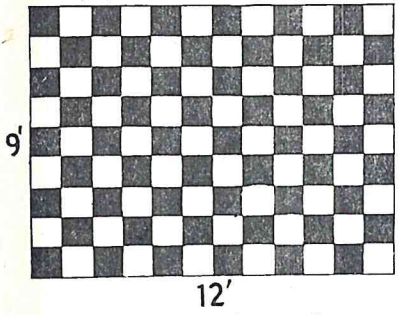
4. How many square inches is the area of the rectangle you drew? What is the area of the picture?

5. On your paper draw a square 2 inches long and 2 inches wide. Cut out enough inch squares to cover the square you drew. How many squares did you need?

6. Can you tell without cutting them out how many inch squares you would need to cover a rectangle 2 inches wide and 4 inches long? Explain.

*7. Name two things each of which has an area of about a square inch.

HOW TO FIND AREAS



1 The picture at the left shows the linoleum on a kitchen floor. Each square is 1 foot long and 1 foot wide. How many ways can you tell how to find the number of square feet in the area of the floor? Which way is best?

2. Tom saw that there were 9 squares in each row and that in all there were 12 rows of squares. So he said, "12 × 9 square feet will give me the number of square feet in the floor." There are (?) square feet in the floor. Give the missing number.

3. Use Tom's plan to find the area of a picture that is 8 inches long and 4 inches wide. Its area is how many square inches?

An easy way to find the area of any surface is to multiply its length by its width, using the same unit of measure in both dimensions.

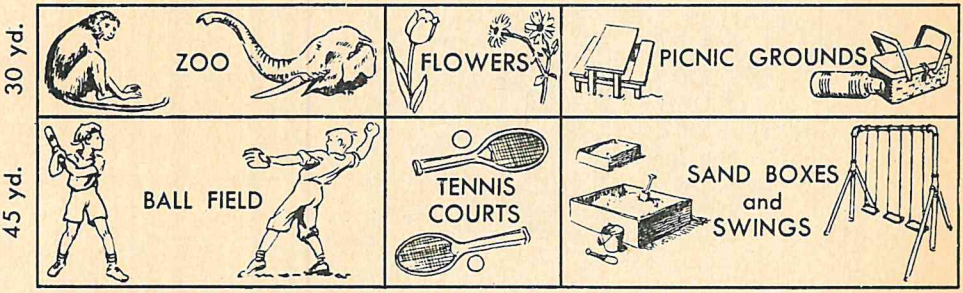
4. What is the area of a table that is 6 feet long and 3 feet wide? Think: 6 × 3 = 18, the number of square feet in the area.

Find the areas of the following:

5. A tablecloth, 8 feet long and 5 feet wide.
6. A floor, 9 feet long and 15 feet wide.
7. A lawn, 40 feet wide and 85 feet long.
8. A field, 95 feet long and 180 feet wide.
9. A blotter, 18 inches long and 32 inches wide.
10. A window, 36 inches long and 48 inches wide.

LAYING OUT A PARK PLAYGROUND

The drawing below is a plan for laying out a playground.



1. How long is the ball field? How wide is it?

2. How long is the place for sand boxes and swings? How wide is it?

3. What are the dimensions of the picnic grounds?

4. What are the dimensions of the space for flowers?

5. How long is the whole playground?

6. How wide is the whole playground?

7. Which has the greater area, the ball field or the space for tennis courts? How much greater is it?

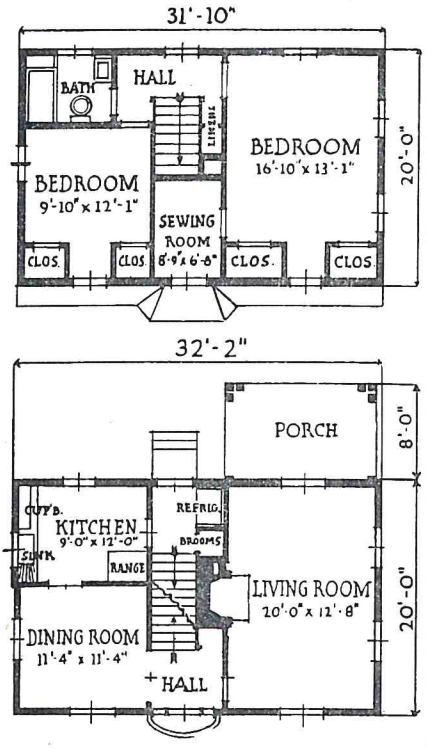
8. Which has the smaller area, the picnic grounds or the zoo? How much smaller?

9. What is the total distance around the playground?

10. Measure the length of the plan in inches. How many yards does each inch on the plan represent?

*11. Draw a plan of the space for sand boxes and swings and divide it into four equal parts. Prove that the parts are equal. There are many ways in which the parts can be divided.

THE SMITHS PLAN A HOME

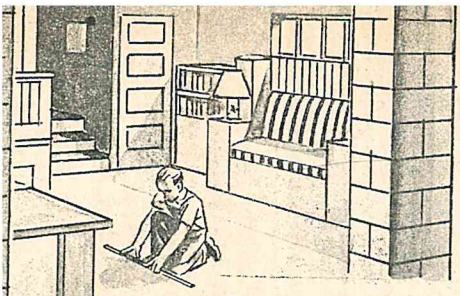


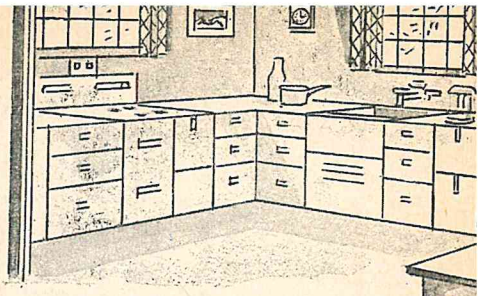
A house plan drawn to scale like the drawing at the left helps the builder to see how the house is to be built. Use the plan to find the answers to the questions below.

1. How long is the house?
2. How wide is the house?
3. How much greater is its width than its length?
4. What are the dimensions of the living room? of the kitchen?
5. Is the dining room a square?
6. How much longer is the large bedroom on the second floor than it is wide?
7. How many closets are there in the house?
8. Use your ruler to measure the length of the house on the plan; the width of the house on the plan.
9. Would a 9′ x 12′ rug be large enough for the small bedroom?
10. Would a 21′ x 18′ rug be too large for the living room?

*11. Find a plan of a house in some magazine or catalogue.

*12. What is an architect? What is the Federal Housing Administration?





BUYING LINOLEUM FOR THE KITCHEN

1. Linoleum is sold by the **square yard.** A square yard of linoleum is a square piece 1 yard long and 1 yard wide. Draw on the blackboard a square equal to a square yard. Write in it: 1 sq. yd.

2. Mrs. Smith wants to buy a linoleum for the kitchen. The floor of the kitchen is 9 ft. by 12 ft. How many yards long is this? How many yards wide? How many **square yards** is its area?

3. At $1.50 a square yard find the cost of the linoleum for the kitchen floor; for a floor 4 yards long and 5 yards wide.

4. Mrs. Smith wishes to buy linoleum for the floor of a playroom. Tom measured the floor for her. It was 15 feet long and 24 feet wide. Find the cost of the linoleum at $1.25 a square yard.

5. How many square feet are there in 1 square yard? THINK: How many feet long is a square a yard long?

6. How many square inches are there in 1 square foot? THINK: How many inches long is a square a foot long?

*7. Farms are measured by the acre. An **acre** is equal to a square piece of land about 208 feet long and 208 feet wide. About how many yards is the perimeter of a field an acre in size?

*8. An acre is equal to a piece of land 10 rods long and 16 rods wide. A rod is $16\frac{1}{2}$ feet long. How many square rods are there in an acre?

THINKING ABOUT MEASURES OF AREA

1. Which of the following rectangles have the same area?

a. $3'' \times 6''$ *b.* $4'' \times 4''$ *c.* $2'' \times 9''$ *d.* $1'' \times 18''$

2. Suppose that you know that the top of a table has an area of 12 square feet. Can you tell what the dimensions of the table are? Can you guess what the dimensions might be?

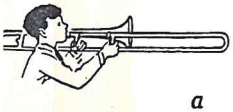
3. What would be the dimensions of a square having an area of 4 square inches?

4. Suppose that you increase the length of a $5'' \times 7''$ rectangle but do not change its width. What happens to the area of the rectangle?

5. Suppose that you increase both the length and the width of the rectangle. What happens to its area?

6. The perimeter of a square is 24 inches. How much is its area?

★7. Give possible dimensions of three rectangles each having an area of 24 square inches.



LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	85×20	$6'5'' + 9'4''$	$9 - 2\frac{3}{4}$	$46\overline{)1413}$	$6\frac{3}{4} - 2\frac{1}{4}$
2.	$65\overline{)3445}$	$4\frac{1}{2} - 4$	$8\frac{3}{4} + 9\frac{3}{4}$	397×64	8 min. 10 sec. − 4 min. 20 sec.
3.	$6\frac{1}{2} + 5\frac{1}{2}$	$\$7.09 \times 38$	$86\overline{)5424}$	$8\frac{1}{4} - 7\frac{3}{4}$	$95\overline{)38871}$

4. Add \$148, \$9.65, \$.08, and \$1.75.

PRACTICE IN FINDING AREAS

A shorter way of saying that a room is 10 feet long and 8 feet wide is to say that it is 10 feet by 8 feet, or 10 ft. x 8 ft.

1. A 9 ft. x 8 ft. rug is (?) feet long and (?) feet wide.
2. In what other way may we write 9 feet 8 inches? What sign stands for feet? What sign stands for inches?
3. What are the dimensions of a 10′ x 9′ wall?
4. What are the dimensions of a $4\frac{1}{2}''$ x 7″ picture?

Find the areas of these rectangles:

5. 6′ x 7′
6. 9″ x 18″
7. 60′ x 75′
8. 15″ x 27″
9. 19 yd. x 27 yd.
10. 12″ x 48″
11. 46′ x 35′
12. 48 yd. x 75 yd.

Learn this table of area or square measures.

144 sq. in. = 1 sq. ft.
9 sq. ft. = 1 sq. yd.
160 sq. rd. = 1 acre (A)
640 A. = 1 sq. mi. or 1 section

*13. In a geography book John saw this statement: "In Belgium there are 688 people to a **square mile**." What does this statement mean? Is there more than one person for each acre in Belgium?

*14. In Nevada there is less than one person to the square mile. In what ways is life in Belgium and Nevada different? How many people are there to the square mile in the state in which you live?

*15. George, who lives in North Dakota, says that his father owns a quarter **section** of land. How many acres of land are there in $\frac{1}{4}$ section?

*16. Find the area of the state in which you live. What is the area of the smallest state in this country?

WHICH IS MORE?

Number 30 lines on your paper. Write the one of the two items below that is more. Try to do this work without using the tables at the back of the book.

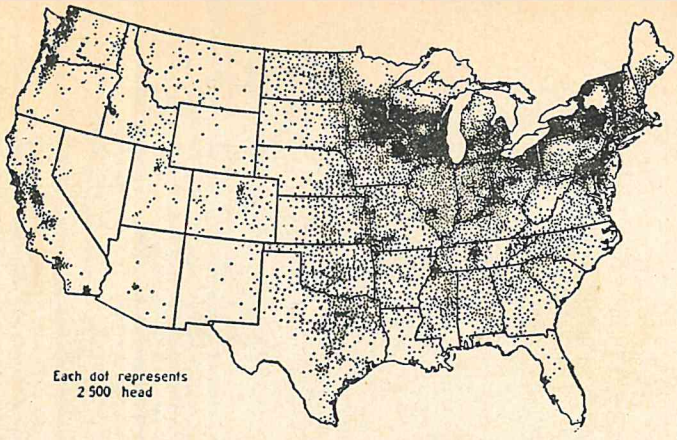
1. 1 lb. or 10 oz.
2. 1 sq. yd. or 8 sq. ft.
3. 4 ft. or 40 in.
4. $\frac{1}{2}$ yd. or $\frac{3}{4}$ yd.
5. 18750 or 18570.
6. 5 hr. or 400 min.
7. 3000 lb. or 2 ton.
8. 12 mo. or 90 da.
9. 3 gal. or 10 qt.
10. 1 yd. 6 in. or 40 in.
11. 50 sq. yd. or 1 acre.
12. 4 da. 12 hr. or 90 hr.
13. 5000 ft. or 1 mi.
14. $\frac{1}{2}$ min. or 40 sec.
15. 1 yd. 2 ft. or 4 ft.
16. 1 lb. 4 oz. or 18 oz.
17. 1 hr. 10 min. or 65 min.
18. 1 mi. or 1000 yd.
19. 25 oz. or 1 lb.
20. $\frac{1}{4}$ hr. or 10 min.
21. 4 pt. or 1 gal.
22. 160 sq. rd. or 1 section.
23. 2 ft. 11 in. or 36 in.
24. $\frac{1}{8}$ or $\frac{1}{4}$.
25. 45 in. or 2 yd.
26. 6 yd. or 20 ft.
27. 24×17 or 16×20.
28. 8 sq. ft. or 144 sq. in.
29. 18 oz. or 1 lb.
30. 1 acre or 1000 sq. in.

How many of your answers were correct? Which tables or facts should you study?

LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$20\overline{)817}$	$3\frac{1}{2}$ $+2\frac{1}{2}$	$6\frac{1}{4}$ $-4\frac{3}{4}$	208 $\times 36$	4′6″ $+5'8''$
2.	$7\frac{1}{4}$ $+\frac{1}{4}$	\$8.75 $\times 84$	$82\overline{)2214}$	$6\frac{7}{8}$ $+5\frac{3}{8}$	5 $-2\frac{1}{4}$
3.	$7\frac{1}{2}$ $-\frac{1}{2}$	4 lb. 8 oz. -2 lb. 10 oz.	$8\frac{3}{4}$ $-1\frac{1}{4}$	$\frac{1}{4}$ of 37 =	$57\overline{)39957}$

4. Add \$78, \$5.87, \$.20, and \$987.67.



READING A DOT MAP

Study this dot map carefully. Use it to find the answers to the questions below.

1. How many head of dairy cattle does one dot represent? 100 dots? 1000 dots?

2. In what states are there the largest numbers of dots? Can you tell how many dots there are on the map of Wisconsin? Why?

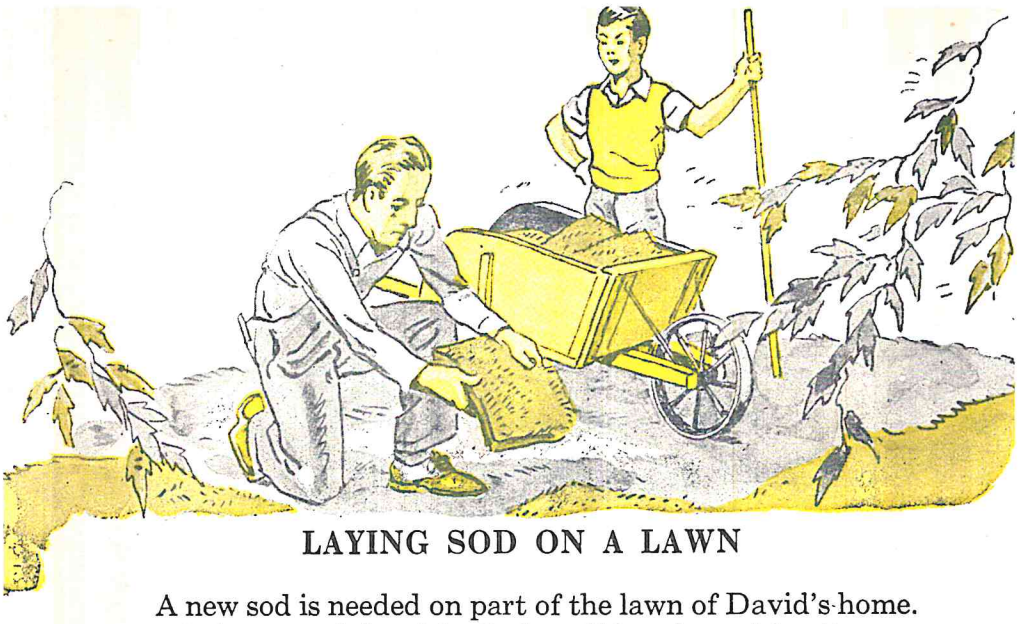
3. Which state raises more dairy cattle, New Mexico or Montana? If you study the map carefully, you can find about how many head of dairy cattle there are in each of these two states. How many are there?

4. Are many dairy cattle raised in Nevada? About how many?

5. Which state raises more dairy cattle, Missouri or Minnesota? Pennsylvania or New York? Colorado or California?

6. There are several places on the map where many of the dots are so close together that the places are quite black. Can you tell why?

*7. Use the map to find out if your state raises many head of dairy cattle. You may be able to tell how many.



LAYING SOD ON A LAWN

A new sod is needed on part of the lawn of David's home. David has found that Mr. Jenks will lay the sod for 40 cents a square yard. Sod is needed for a lawn 24 feet by 30 feet. David wants to find out how much the sod will cost.

1. Because the cost of the sod is by the square yard, David must find the area of the lawn in square yards. How many yards long is the lawn? How many yards wide is it?

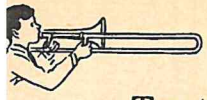
2. What is the area of the lawn in square yards?

3. Another way to find the number of square yards in the lawn would be to find its area in square feet. There are 9 square feet in a square yard. How can you find the number of square yards in the lawn if you know the number of square feet it contains? Does this method give the same answer as problem 2?

4. Find the cost of the sod for the lawn.

5. Find the cost of sod for a 15 foot by 45 foot lawn at 45 cents a square yard.

*6. Find the cost of laying sod for lawns where you live.



LET'S PRACTICE

Try to get every example right. To see how your work improves, you may also try the same set of examples on three days.

Set I

1. 439 / 138 / 554 / 368 / 275 / 487

2. $2'4'' + 3'9''$

3. $3\frac{3}{4} + 5\frac{3}{4}$

4. $6 - 4\frac{1}{4}$

5. 208×36

6. $\frac{1}{4}$ of 18 =

7. $30\overline{)2713}$

8. 20 min. = ? hr.

9. 3 lb. 2 oz. − 1 lb. 8 oz.

10. $97\overline{)29701}$

Set II

1. 196 / 243 / 552 / 445 / 891 / 886

2. 3 hr. 15 min. + 4 hr. 10 min.

3. $6\frac{1}{4} + 3\frac{1}{4}$

4. $7\frac{3}{4} - 5\frac{1}{4}$

5. $\$4.90 \times 57$

6. $\frac{1}{2}$ of 19 =

7. $74\overline{)4440}$

8. $\$810.75 - 370.96$

9. 3 gal. 3 qt. − 1 gal. 2 qt.

10. $45\overline{)2345}$

USING THE LANGUAGE OF ARITHMETIC

Name at least two things that are sold by each of these units of measure:

yard	quart	ounce	pint	sack
dozen	foot	barrel	ten	square yard
pound	bushel	piece	gallon	bag
box	hundredweight	cord	peck	acre

HOW WELL DO YOU REMEMBER?

1. In what two ways can you find the sum of 4 ft. 6 in. and 5 ft. 3 in.? What is the sum?
2. Show that 36 minutes equals $\frac{36}{60}$ hour.
3. Express in simplest form:
   a. 3 lb. 20 oz. *b.* 4 gal. 5 qt. *c.* 6 hr. 75 min.
4. Make a list of the units for measuring areas that you have learned, placing the smallest unit first.
5. Which unit would be used in measuring each of the following?
   a. The size of a small farm.
   b. The size of a stamp.
   c. The size of a piece of linoleum.
   d. The area of a state.
   e. The area of the walls of a room.
   f. The size of a small garden.

INFORMATION PLEASE!

1. What are the annual rings in a tree?
2. In what ways do people use the measurement of area?
3. Why do we need to know how to find the area of a surface?
4. What do we mean by "approximate"?
5. In what ways has man measured distance?
6. What is a "gale"?
7. Name some things that are drawn to a scale. What do we mean when we say that a map is drawn to the scale of 1 in. = 1 mi.?
8. Use the following words in sentences:

estimate	dimensions	plan	weight
perimeter	area	production	million
time line	sale	ton	century

MEASURING GROWTH IN PROBLEM SOLVING

1. Joe has saved $47.08. Peter has saved $38.29. How much more has Joe saved than Peter?

2. How many eggs are there in 36 boxes of eggs, each of which contains a dozen eggs?

3. Ann has $5\frac{1}{4}$ yards of red ribbon and $3\frac{3}{4}$ yards of blue ribbon. How much less blue ribbon than red ribbon has she?

4. Agnes practices her music lesson 40 minutes each day. What part of an hour is 40 minutes?

5. The class is planning a picnic. There are 16 boys and 18 girls in the class. If each child brings 20 cents to pay for things to eat, how much money will the class have to spend?

6. John bought 8 quarts of milk at 12 cents a quart. How much change should he receive from the $5 bill he gave to the clerk?

7. The lot on which Mary's house is built is 45 feet wide and 148 feet long. What is the area of the lot?

8. Ben can ride a mile on his bicycle in 4 minutes 35 seconds. It takes Jane 5 minutes 55 seconds to ride a mile on her bicycle. How much longer does it take Jane than it takes Ben to ride a mile?

9. A farmer sold some crates of chickens that weighed in all 208 pounds. There were 32 chickens in the crates. What was the average weight of the chickens?

10. George is making a play yard for his young puppy. It is to be 8 feet long and $6\frac{1}{2}$ feet wide. How much will wire for the fence around the play yard cost at 5 cents a foot?

What Your Score Means

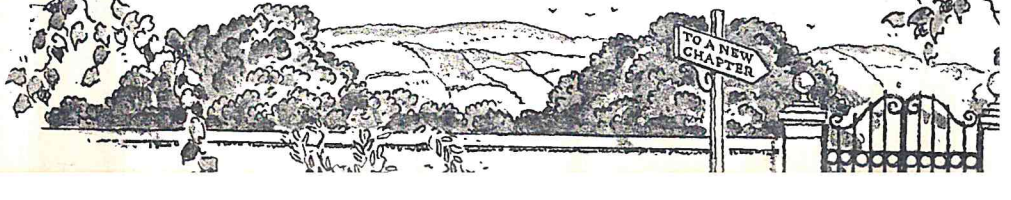
Unsatisfactory	Fair	Good	Excellent
0 1 2 3 4	5 6	7 8	9 10

OPENING THE GATE TO THE NEW CHAPTER

Use this test to find how well you have learned to work the kinds of examples you have studied. Try to work every example correctly.

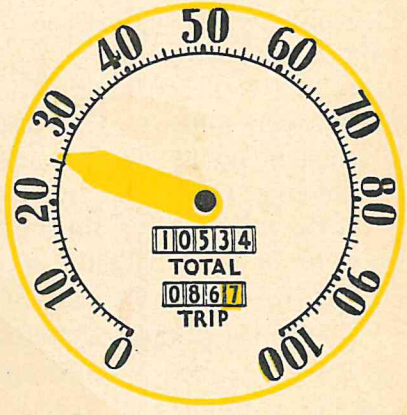
1. Add: \$69.58, \$7.67, \$45.20, and \$9.64. (14)
2. How much is 50×698? (49)
3. Multiply: 69×3952. (69)
4. Reduce to lowest terms: $\frac{15}{20}$, $\frac{12}{16}$, $\frac{15}{60}$. (94)
5. Express in simplest form: $4\frac{2}{4}$, $\frac{11}{4}$, $9\frac{5}{4}$, $8\frac{6}{2}$. (94)
6. How much is $3\frac{3}{8} + 4\frac{1}{8}$? (102)
7. Add: $5\frac{3}{4} + 6\frac{1}{4} + 4\frac{1}{4} = ?$ (168)
8. How much less than $8\frac{3}{4}$ inches is $4\frac{1}{4}$ inches? (114)
9. Subtract: $9 - 1\frac{1}{2} = ?$ (183)
10. Subtract $5\frac{3}{4}$ from $9\frac{1}{4}$. (189)
11. Divide 1480 by 35. Check your work. (211)
12. Divide 1070 by 46. Check your work. (211)
13. Divide 51340 by 85. Check your work. (220)
14. Divide 6784 by 32. (219)
15. Divide 6732 by 32. (223)
16. Express in simpler form: 3 lb. 20 oz. (249)
17. How much is 4 min. 45 sec. + 3 min. 20 sec.? (248)
18. How much is 9 ft. 6 in. − 4 ft. 9 in.? (250)
19. Find the perimeter of a $4\frac{1}{2}$-inch square. (245)
20. What is the area of an 18′ x 25′ rectangle? (258)

After your paper has been marked, correct your work at once. If you need help, turn to the pages given at the right.



CHAPTER VIII

READING THE SPEEDOMETER



Every automobile has a speedometer that tells how fast and how far the car travels. The picture at the right shows how far Mr. Brown's automobile has gone in all and how far it has gone on this trip.

1. What is the total number of miles the automobile has traveled in all? Copy the figures and use a comma to divide them into periods or groups. Is it now easier to read?

2. What is the place value of each figure in 10,534?

3. Look at the trip distance. The 7 in the colored box stands for $\frac{7}{10}$. Any number that shows in color is read as tenths of a mile. The denominator 10 is not written. How far has the car gone on this trip?

4. How many tenths of a mile are there in a whole mile?

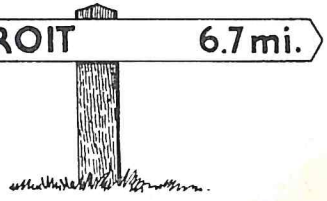
5. Make a drawing of the "trip" part of the speedometer showing how it will look when the car has gone $96\frac{4}{10}$ miles; $105\frac{3}{10}$ miles; 110 miles.

6. Which is more, $\frac{1}{10}$ mile or $\frac{1}{100}$ mile?

7. One morning Mr. Brown drove $76\frac{7}{10}$ miles. That afternoon he drove $85\frac{4}{10}$ miles. How far did he drive in all?

8. Show by using the picture of the speedometer that the 0 may be a starting point in measuring.

HOW TO READ DECIMAL FRACTIONS



On an automobile trip George saw this sign at the side of the road:

At first George thought that the sign showed that it was sixty-seven miles to Detroit, but he knew he was wrong because he could see the tops of several of the big buildings in the city. His father told him that 6.7 mi. is read: 6 and 7 tenths miles. 6.7 is another way to write $6\frac{7}{10}$. It is easier to write or print 6.7 than to write or print $6\frac{7}{10}$.

The period in 6.7 is called a **decimal point**. The number .7 is called a **decimal fraction**. .7 means $\frac{7}{10}$. The fraction $\frac{7}{10}$ is often called a **common fraction**. To save time we usually call decimal fractions "decimals" and common fractions "fractions." Remember that numbers like $6\frac{7}{10}$ are called mixed numbers. A mixed number like $6\frac{7}{10}$ may also be written as a **mixed decimal**, as 6.7.

In reading a decimal like 8.9, the **"and"** tells where the decimal point is placed. 8.9 is read: **8 and 9 tenths.**

Read these distances:

1. 2.5 mi.
2. 6.8 ft.
3. 7.4 yd.
4. 18.7 mi.
5. 37.6 in.
6. 27.1 mi.
7. 175.8 ft.
8. 306.9 yd.
9. 300.2 mi.

10. Write the distances in 1 to 9 in the fraction way.

11. Write as decimal fractions:

$\frac{3}{10}$ $\frac{1}{10}$ $\frac{7}{10}$ $\frac{9}{10}$ $6\frac{5}{10}$ $27\frac{6}{10}$ $198\frac{8}{10}$

12. Read these numbers. Tell which are fractions and which are decimals. Then write them the other way:

a. $3\frac{1}{10}$ .5 $27\frac{3}{10}$ $\frac{6}{10}$ 9.4 $28\frac{7}{10}$

b. .6 1.1 $\frac{9}{10}$ $7\frac{3}{10}$ 48.4 318.9 .2

READINESS TEST FOR ADDING AND SUBTRACTING DECIMAL FRACTIONS

In the work below be sure to mark off dollars and cents in the answers.

I. Find the sums:

1.	2.	3.	4.	5.
\$.75 .68	\$.97 .02	\$8.21 4.79	\$.06 .03	\$9.00 4.75

6. Add \$37.95, \$.10, \$1.87, and \$236.88.

II. Subtract these numbers. Check by addition:

1.	2.	3.	4.	5.
\$98.45 27.68	\$.98 .47	\$6.40 3.20	\$.28 .19	\$8.37 8.29

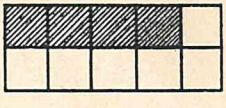
6. Subtract \$35.68 from \$75.

III. Find the answers:

1.	2.	3.	4.	5.	6.
$5\frac{3}{10}$ $+2\frac{4}{10}$	$\frac{7}{10}$ $+\frac{4}{10}$	$9\frac{7}{10}$ $-4\frac{3}{10}$	$8\frac{1}{10}$ $-2\frac{8}{10}$	6 $-2\frac{9}{10}$	$\frac{9}{10}$ $-\frac{4}{10}$

IV. Changing fractions and decimals.

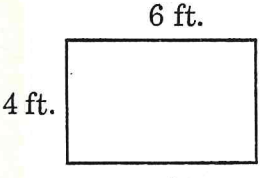
1. Write as decimals: $4\frac{3}{10}$; $\frac{6}{10}$; $20\frac{1}{10}$.
2. Write as fractions: 5.2; 6.8; 3:1.
3. Which is more, $\frac{3}{10}$ inch or .4 inch? .5 inch or $\frac{7}{10}$ inch?
4. What part of the rectangle at the right is shaded? Express your answer as a fraction and as a decimal.



5. What part of the rectangle is not shaded? Express your answer in two ways.
6. How many fourths are there in 1? How many tenths? How many dimes are there in a dollar?
7. What part of a dollar is a dime?
8. How much more than a dollar is 14 dimes?
9. There are how many dimes in \$1.70?

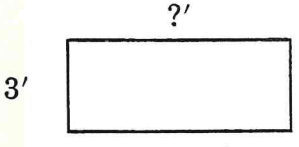
*SAME PERIMETERS—DIFFERENT AREAS

John has a piece of wire netting 20 feet long. He wishes to make as large a play yard as he can for his puppy. What would be the area of the largest play yard he can make with this much wire netting?



1. The drawing at the left shows one way in which John thought that he might make the play yard. Would he use all of the wire netting?

2. What would be the area of the play yard?



3. If he made the play yard 3 feet wide, how much would its length be?

4. What is the area of a play yard 3 feet by 7 feet?

5. If he made the play yard 9 feet wide, how long would it be if he used all of the netting?

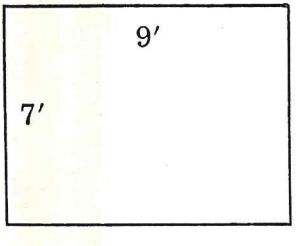
6. What would be the area of the play yard?

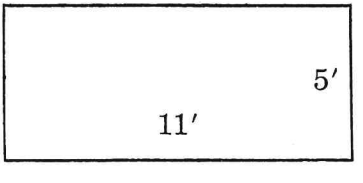
7. If he made the play yard 5 feet long, how wide would it be? How would the sides compare in length?

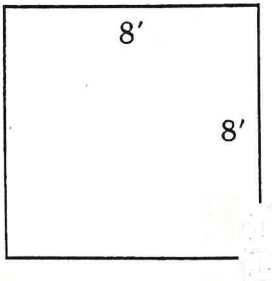
8. What would be the area of the play yard?

9. Which of the four play yards whose areas you have found has the largest area?

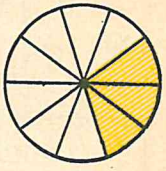
10. How do the perimeters of these rectangles compare? Which has the largest area?







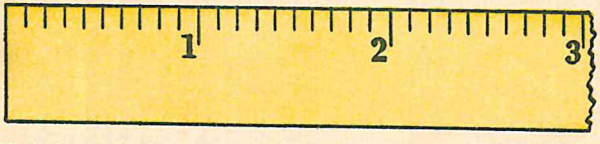
PICTURING DECIMAL FRACTIONS



1. Into how many parts is the circle at the right divided? What fraction of the whole circle is each part? Express this fraction as a decimal.

2. What part of the circle is shaded? What part is not shaded? Express both answers as decimals.

3. Mr. Jordan, an architect, uses a ruler like the one below. It is divided into tenths of an inch. How many tenths are there in 1 inch? in 1.1 inches? in 1.3 inches?



4. Which is longer, 2 inches or 1.7 inches? .5 inch or 3 inches? 1.9 inches or .6 inch?

5. Which is more, 1.9 inches or 2.1 inches? 2.7 inches or 9 inches? 11 tenths inch or 1.1 inches?

6. Which is most:

a. .9 in., 3 in., or 2.5 in.
b. 1.4 in., .7 in., or 2 in.
c. 2, 1.5, or 12 tenths.
d. 3.1, 2.7, or 4?

7. Jane changed $1\frac{7}{10}$ to 17. What is wrong?

8. Lay your ruler on the ruler above. Find how many tenths of an inch there are in one half inch.

9. Does $\frac{5}{10}$ inch equal $\frac{1}{2}$ inch? Does .5 inch equal $\frac{1}{2}$ inch?

10. Use your ruler to find if 2.5 inches equals $2\frac{1}{2}$ inches.

11. Express the decimal 2.5 in the fraction form, and reduce the number to simplest form.

12. You can see that $.5 = \frac{5}{10} = \frac{1}{2}$. Show that .2 equals $\frac{1}{5}$; that .8 equals $\frac{4}{5}$.

13. How many tenths are there in 1.5? in 1.9?

14. How much more than 1 inch is twelve tenths inch?

ADDITION OF DECIMAL FRACTIONS

1. It is 1.5 miles from Jack's home to the store and 1.2 miles beyond the store to the school. How far is it from Jack's home to the school?

THINK: 1.5 mi. + 1.2 mi. = ? mi.
This problem can be worked with fractions or decimals.

WITH FRACTIONS	WITH DECIMALS	
$1\frac{5}{10}$	1.5	First add the tenths, then the ones. 5 tenths + 2 tenths = 7 tenths.
$+1\frac{2}{10}$	+1.2	Write .7 in tenths' place.
$2\frac{7}{10}$	2.7	Add the whole numbers: 1 one + 1 one = 2 ones. Write 2 in ones' place.
It is $2\frac{7}{10}$ mi. to the school.		The sum is 2.7. Is 2.7 the same as $2\frac{7}{10}$?

2. Study these examples. Then copy and work them.

a. .7 + .2 = ? *b*. 3.1 + .2 = ? *c*. 2.4 + 3.5 = ?

$\frac{7}{10} = .7$	$3\frac{1}{10} = 3.1$	$2\frac{4}{10} = 2.4$
$\frac{2}{10} = .2$	$\frac{2}{10} = .2$	$3\frac{5}{10} = 3.5$
$\frac{9}{10}$ .9	$3\frac{3}{10}$ 3.3	$5\frac{9}{10}$ 5.9

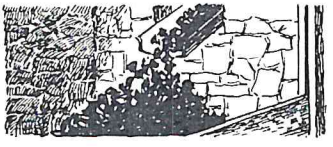
Be sure to place the decimal point in the sum directly under the decimal points in the numbers being added.

3. One day Helen walked .4 mile to the store and .3 mile from the store to the lake. How far did she walk in all?

4. Mr. Jones bought three loads of coal weighing 2.1 tons, 2.4 tons, and 2.3 tons. Find the total weight of the coal.

Add, using both the fraction and the decimal ways:

5. 3.2 ft. + 2.1 ft. + 3.4 ft. =
6. $2\frac{1}{10}$ in. + $4\frac{7}{10}$ in. + $\frac{1}{10}$ in. =
7. .3 qt. + .4 qt. + .2 qt. =
8. 3.2 lb. + .4 lb. + 6.3 lb. =



DECIMAL FRACTIONS WITH CARRYING

1. John's father drove to the lake in 2.8 hours. It took him 2.5 hours to drive back. How long did it take him to drive to the lake and back?

THE FRACTION WAY

This problem can be solved by using fractions as follows:

$2\frac{8}{10}$
$2\frac{5}{10}$
$5\frac{3}{10}$

You know that $2.8 = 2\frac{8}{10}$ and that $2.5 = 2\frac{5}{10}$. The fraction $\frac{13}{10}$ is the same as $1\frac{3}{10}$, or 1.3. $4\frac{13}{10} = 4 + 1\frac{3}{10}$. You carry the 1 in $1\frac{3}{10}$ and add it to the $2 + 2$. Is $5\frac{3}{10}$ equal to 5.3?

THE DECIMAL WAY

THINK: 2.8 hr. + 2.5 hr. = ?

2.8
2.5
5.3

5 tenths + 8 tenths = 13 tenths. 13 tenths is 1 whole and 3 tenths. So write .3 in the sum and carry 1 to the ones' column. Add 1 + 2 + 2 = 5. Write 5 under the ones. He drove both ways in 5.3 hours.

2. Study the examples below. When you understand them, copy, and then work them with your book closed.

a.	*b.*	*c.*	*d.*	*e.*
3.7	.4	.9	1.6	84.7
2.4	.9	3.8	37.8	6.9
6.1	1.3	4.7	39.4	91.6

3. Now work the examples in 2 by using fractions. Find the sums:

	a	*b*	*c*
4.	7.8 + 5.9 =	.8 + 6.7 =	.7 + .8 + .9 =
5.	8.4 + 6.3 =	9.5 + .6 =	2.7 + 6.9 + .5 =
6.	.7 + .5 =	27.7 + 6.6 =	3.7 + .6 + .8 =

LARGE NUMBERS IN THE NEWS

1. In a newspaper Helen read that there were 41,000,000 telephones in the world. In the United States alone there were 20,000,000 telephones. How many telephones were there in the rest of the world?

2. Did the United States have half of the telephones in the world? How many more or less than half?

3. The telephone people tell us that they use six hundred thousand poles a year, seventy million pounds of paper for directories and fifty million paper clips. Write these amounts in figures.

4. In a recent year the United States produced 4,809,000 automobiles. The world total was 6,353,000 cars. How many more automobiles were produced that year in the United States than in the rest of the world?

*5. In a recent year there were 3,889,091 farms in the United States operated by the owners, 481,604 operated by managers, and 2,865,155 operated by tenants (people who pay rent). How many farms were there in all?

*6. Look for other examples of large numbers in magazines, books, and newspapers.

LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$3\frac{1}{2}$ $+2\frac{1}{2}$	3.8 $+7.5$	$96\frac{3}{4}$ $-38\frac{1}{4}$	4.1 $+2.3$	44 $-25\frac{1}{2}$
2.	$25\overline{)763}$	$6\frac{1}{4}$ $+9\frac{1}{4}$	487 $\times 96$	$80\frac{1}{4}$ $-44\frac{3}{4}$	$84\overline{)6888}$
3.	85 $\times 30$	$56\overline{)8512}$	$6\frac{3}{4}$ $+7\frac{3}{4}$	$73\overline{)66228}$	78.6 $+5.9$

4. Add \$27.86, \$8.00, \$478.96, and \$.27.

SUBTRACTING DECIMAL FRACTIONS

1. Jane and Arthur have new bicycles. One morning Jane rode 6.7 miles and Arthur rode 5.4 miles. How much farther did Jane ride than Arthur?

WITH FRACTIONS	WITH DECIMALS	THINK: 6.7 mi. − 5.4 mi. = ?
$6\frac{7}{10}$	6.7	Subtract tenths, then ones.
$-5\frac{4}{10}$	−5.4	.7 − .4 = 3 tenths.
$1\frac{3}{10}$	1.3	Write .3 under tenths.
		6 ones − 5 ones = 1 one.
		Write 1 under ones.

The answer is 1.3 miles. Does 1.3 equal $1\frac{3}{10}$?
Jane rode 1.3 miles farther than Arthur.
Check both answers by addition.

2. The next day Arthur rode 9.2 miles and Jane 7.5 miles. How much farther did Arthur ride than Jane?

WITH FRACTIONS	WITH DECIMALS	THINK: 9.2 mi. − 7.5 mi. = ?
$9\frac{2}{10} = 8\frac{12}{10}$	9.2	You cannot subtract .5 from .2. So take one of the 9 ones and change it to 10 tenths. The 10 tenths and 2 tenths are 12 tenths. 12 tenths − 5 tenths = 7 tenths. Write .7. Subtract 7 ones from 8 ones. Write 1.
$-7\frac{5}{10} = 7\frac{5}{10}$	−7.5	
$1\frac{7}{10}$	1.7	

Arthur rode 1.7 miles farther than Jane.

3. Study these examples, copy and work them with your book closed.

a.	*b.*	*c.*	*d.*	*e.*
6.6	7.1	8.3	29.4	.8
−2.6	−4.4	−.6	−28.3	−.2
4.0	2.7	7.7	1.1	.6

4. Check the answers by subtracting with fractions.

SUBTRACTING DECIMAL FRACTIONS

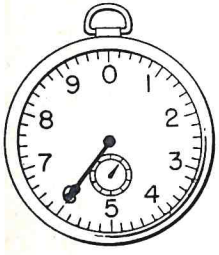
Subtract. Check your answers by addition and also by subtracting with fractions.

	a	*b*	*c*
1.	7.4 − 6.1 =	8.2 − 1.9 =	47.4 − 6.8 =
2.	.8 − .4 =	7.4 − 3.7 =	33.5 − 8.6 =
3.	1.5 − 1.3 =	6.3 − .9 =	27.9 − 3.5 =
4.	27.9 − 16.4 =	1.8 − .9 =	48.2 − 3.9 =
5.	36.8 − 35.8 =	27.3 − 16.4 =	56.3 − 27.3 =

USING DECIMALS

1. Harold can run 50 yards in 7.8 seconds. Frank can run 50 yards in 8.1 seconds. How much longer does it take Frank than it takes Harold to run 50 yards?

2. Jack has a pedometer to measure how far he walks each day. On Sunday he walked 4.3 miles, on Monday 5.6 miles, and on Tuesday 6.1 miles. How far did he walk in the three days? Find out what a pedometer is and how it works.



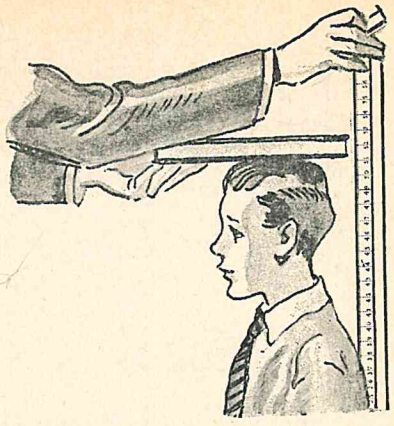
3. The record for the 40-yard swim is 28.3 seconds. Keith swam that distance in 30.4 seconds. How much more time than the record did it take him?

4. At the start of an automobile trip the speedometer reading was 007.5. At the end it was 304.2. How many miles was the trip?

5. A farmer has two pastures for his cattle. One pasture contains 6.5 acres, the other 7.8 acres. How many acres were there in the two pastures?

6. The average cost of driving an automobile a mile is 1.6 cents for gasoline and oil, and 1.2 cents for tires and repairs, and 2.7 cents for the car itself. How much is the total cost of driving an automobile a mile?

HOW FAST DO YOU GROW?



How much do children grow at different ages? Do boys and girls grow at the same rate each year? Are there any ages at which boys are shorter than girls? The table below will help you to answer these questions.

HEIGHT IN INCHES

Age	Boys	Girls
8	49.1	48.8
9	51.1	50.7
10	52.9	52.6
11	54.7	54.8
12	56.4	57.1
13	58.6	59.4
14	61.1	61.1
15	63.5	62.1
16	65.5	62.2
17	66.7	62.8
18	67.2	62.8
Adults	67.5	62.8

1. At what ages are boys taller than girls? shorter than girls?

2. At what age are boys and girls equal in height?

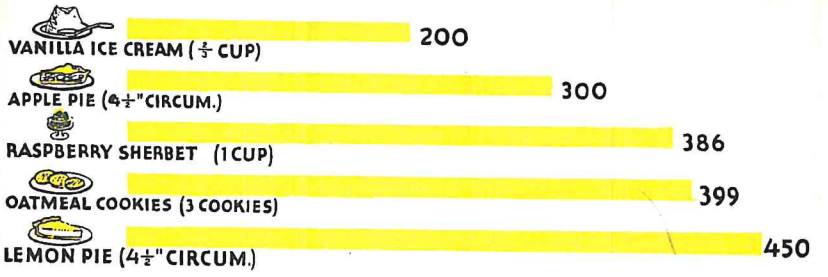
3. How much taller than 10-year-old girls are 10-year-old boys?

4. How much do boys grow between the ages of 8 and 9? 9 and 10? 10 and 11? between each of the other years?

5. Tom is 12 years old. He is 58.1 inches tall. How much taller than the average boy of his age is he?

PRACTICE WITH DECIMAL FRACTIONS

1.	4.8	2.	.3	3.	26.7	4.	48.2	5.	6.2
	5.2		.8		8.4		3.4		27.3
	+6.7		+.4		+.9		+14.0		+.4
6.	27.8	7.	86.5	8.	53.0	9.	89.5	10.	85.7
	−4.1		−27.8		−6.7		−79.6		−36.0



*CALORIES IN POPULAR DESSERTS

When we say that $\frac{2}{3}$ cup of vanilla ice cream contains 200 calories, we mean that it gives us that much energy to do work. Look up more information about the meaning of calories in your health, science, or reference books.

The graph above shows how many calories there are in servings of some of our popular desserts. The amounts of the servings are also given. Just as we measure amounts in cupfuls or by the pound, we measure food value in calories.

1. According to the graph, how many calories are there in a serving of ice cream? How large is a serving?

2. Are there as many calories in a serving of apple pie as in a serving of lemon pie? What is the difference in calories?

3. Which has more calories, a serving of ice cream or a serving of sherbet? How many more? What is the difference in their size?

4. Are there more than twice as many calories in a serving of lemon pie as there are in a serving of ice cream? In what two ways does the graph help you to find the answer to this question?

5. How many calories are there in one oatmeal cookie?

*6. Which of these desserts should people eat who wish to gain in weight? How many calories would there be in a double serving of ice cream?

HOW PRICES CHANGE

1. In 1900 one pound of butter cost 26.1 cents. In 1920 the price was 70.1 cents a pound. Find the difference in the price a pound.

2. In 1937 the price of butter was 40.8 cents a pound. How much more than the price in 1900 was this? How much less than the price in 1920? What is the price of butter today?

3. In a recent year the average price of butter a pound was 29.9 cents in Minneapolis and 33.7 cents in Los Angeles. How much less was the price in Minneapolis than in Los Angeles? Can you give any reasons for the difference?

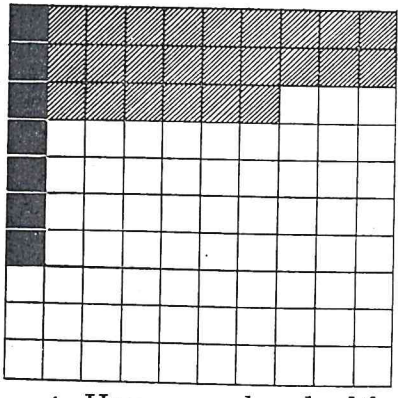
4. That year oranges cost 16.2 cents a dozen in California and 43.0 cents a dozen in New York. What was the difference in the price? Where are oranges raised?

5. In 1900 milk cost only 6.2 cents a quart. In another year the average price was about 11.6 cents a quart. How much higher is the price today than in each of those years?

6. In October Mrs. Jordan bought a 100-lb. bag of potatoes for $1.15. In the next March she bought a 100-lb. bag of the same kind of potatoes for $2.40. Find the difference in price. Why was the price higher in March?

*7. Make a list of reasons why prices change and why they are not the same in all parts of the country.

PICTURING HUNDREDTHS



1. How many small squares are there in the square at the left?

We can say that each small square is $\frac{1}{100}$ of the large square.

2. How many hundredths of the big square are black?

3. How many hundredths are shaded?

4. How many hundredths are not shaded?

Fractions like $\frac{1}{100}$, $\frac{7}{100}$, and $\frac{24}{100}$ whose denominators are 100 can be written as decimals.

$\frac{1}{100}$ is written .01 .01 is read: one hundredth

$\frac{7}{100}$ is written .07 .07 is read: seven hundredths

$\frac{24}{100}$ is written .24 .24 is read: twenty-four hundredths

The 0 in .01 shows that there are no tenths.

5. Read these decimals. Then write them as fractions.

.04 .11 .20 5.37 7.6 2.75 1.5

6. Write as decimals, then read them:

$\frac{2}{100}$ $\frac{9}{100}$ $\frac{25}{100}$ $2\frac{30}{100}$ $4\frac{75}{100}$ $3\frac{97}{100}$ $1\frac{7}{10}$

7. Write the numbers below as decimals and as fractions:

a. Fifteen hundredths

b. Seventy-one hundredths

c. One and nine tenths

d. Four and six hundredths

e. Nine and sixty-three hundredths

8. There are 10 small squares in each row of the large square above. What part of the whole square is the 10 small squares? $\frac{10}{100}$ = (?) part of the square?

EXPRESSING CENTS AS DECIMALS

1. You know that there are 100 cents in a dollar. So one cent is $\frac{1}{100}$ of a dollar. We can say that 3 cents is $\frac{3}{100}$ of a dollar, or that 27 cents is $\frac{27}{100}$ of a dollar. Do you know how to write 1 cent, 3 cents, and 27 cents with dollar signs?

$1¢ = \frac{1}{100}$ dollar = \$.01	$3\frac{1}{100}$ dollars = \$3.01
$3¢ = \frac{3}{100}$ dollar = \$.03	$7\frac{3}{100}$ dollars = \$7.03
$27¢ = \frac{27}{100}$ dollar = \$.27	$8\frac{27}{100}$ dollars = \$8.27

You can see that in the number \$8.27, the point separating dollars and cents is a decimal point separating whole dollars from hundredths of a dollar.

2. How many hundredths of a dollar is \$.05? \$.47? \$.85?

3. There are 100 cents in a dollar. This means that $\frac{100}{100}$ of a dollar makes a whole dollar. We write $\frac{100}{100}$ of a dollar as \$1.00. \$1.00 means 1 dollar and no cents.

4. How many dimes are there in a dollar? What part of a dollar is 1 dime? 3 dimes? 7 dimes? 10 dimes?

5. How many tenths of a dollar is \$.20? \$.60? \$.70?

6. \$.10 is how many hundredths of a dollar?

7. Reduce $\frac{10}{100}$ to lowest terms. 10 hundredths = (?) tenths.

8. The number \$.74 contains (?) dimes and (?) cents, or (?) tenths of a dollar and (?) hundredths of a dollar.

9. \$1.00 means (?) whole and (?) tenths and (?) hundredths.

10. \$2.75 means (?) wholes and (?) tenths and (?) hundredths.

11. Write in decimal form: 6 cents; 4 dimes; $\frac{5}{100}$ dollar; $\frac{12}{100}$ dollar; $3\frac{16}{100}$ dollars.

PLACE VALUES IN OUR NUMBER SYSTEM

In the number 375 we say that the 5 is in ones' place, the 7 is in tens' place, and the 3 is in hundreds' place. In the number 375.26 the decimal point separates the whole number part from the decimal part. The .2 means 2 tenths. We say that the 2 is in tenths' place. The 6 means 6 hundredths, and we say that the six is in hundredths' place.

Hundreds	Tens	Ones		Tenths	Hundredths
3	7	5	•	2	6

The chart above will help you to remember the names to the right of the decimal point. Starting from the ones' place, the first figure to the left of ones is **tens;** the first figure to the right of ones is **tenths.** The second figure to the left of ones is **hundreds;** the second figure to the right of ones is **hundredths.** The whole number is to the left of the decimal point; the decimal part is to the right of the decimal point.

200	or 2 hundreds
20	or 2 tens
2	or 2 ones
.2	or 2 tenths
.02	or 2 hundredths
222.22	

1. The number 222.22 contains the figure 2 in the five places. Beginning at the left what is the value of the first 2? the second 2? the third 2? the fourth 2? the fifth 2?

2. Does the value of 2 in each place grow greater or less as you go to the left from the ones' place?

3. Do the values of the places grow greater or less as you go to the right from the ones' place?

Write these numbers the way 222.22 was written in the box above to show the values of the figures in each place:

4. 330.33 5. 275.60 6. 907.45 7. 260.08

THE IMPORTANCE OF PLACE VALUE

Zero is a very important number in our number system. To see why this is true, study the work below carefully.

1. Look at the numbers in the box. How does the zero help us to show the value of the 3? What place does the zero hold in 30? in 300?

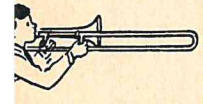
3	III
30	XXX
300	CCC

2. How did the Romans show 3? 30? 300? Did the Romans have a certain value for each place in their number system? How can you tell?

3. The Roman numeral CCII means 202. Did the Romans have a place holder in their system? Do we have a place holder?

4. The letter M stands for 1000. Write the number one thousand two in Roman numerals and in Arabic numerals. In which number did you use zero as a place holder?

5. Does $\frac{1}{10}$ in $7\frac{1}{10}$ have a place value? Why may we say that common fractions are an addition to our number system? Do $7\frac{1}{10}$ and 7.1 have the same value? Why?



LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	$27.4 - 16.3$	$7\frac{1}{2} + 5\frac{1}{2}$	84×50	$9\frac{1}{4} - 5\frac{1}{4}$	$45\overline{)7290}$
2.	$8\overline{)164}$	$7 - 4\frac{3}{4}$	$47.5 + 26.8$	$6\frac{1}{4} + 7\frac{1}{4}$	$\$9.38 \times 68$
3.	$8\frac{3}{4} + 8\frac{3}{4}$	2 ft. 8 in. + 3 ft. 6 in.	$6\frac{1}{4} - 2\frac{3}{4}$	$895.5 - 627.8$	$84\overline{)3528}$

4. Add: 2786 + 679 + 47 + 5847 + 69 =

THE PENNSYLVANIA TURNPIKE

Courtesy Penna. Turnpike Commission

LOG OF TURNPIKE

(Miles)	
0	Irwin
8.5	New Stanton
23.7	Donegal
33.0	Laurel Hill Tunnel
35.8	Laurel Hill Gas Station
42.9	Somerset
55.8	Allegheny Tunnel
63.2	New Baltimore Gas Station
78.5	Bedford
80.3	Midway Gas Station
95.9	Breezewood
98.1	Rays Hill Tunnel
102.9	Sideling Hill Tunnel
112.6	Fort Littleton
119.8	Tuscarora Tunnel

The table above shows part of the log, or mileage, of the Pennsylvania Turnpike, an important highway.

1. The Turnpike is 159.6 miles long. How many miles are not shown on this table?

2. How far would a motorist travel on the Turnpike if he got on at Donegal and got off at Fort Littleton?

3. How far would a motorist have to go before he could get some gasoline if he got on the Turnpike at Somerset?

4. Can an automobile that averages 16 miles to a gallon of gasoline travel the 159.6 miles of turnpike on 10 gallons of gasoline? Prove that your answer is correct.

5. The speed limit on the Turnpike is 70 miles an hour, except through the tunnels, where the limit is reduced one half. What is the speed limit through the tunnels?

TUNNELS ON THE TURNPIKE

Name of Tunnel	Length (Miles)	Name of Tunnel	Length (Miles)
Laurel Hill	.8	Tuscarora	1.
Allegheny	1.1	Kittatinny	.9
Rays Hill	.6	Blue Mountain	.8
Sideling Hill	1.3		

6. There are in all 7 tunnels through the mountains on this Turnpike. Which tunnel is the longest? How much longer than a mile is it?

7. How much longer is the longest tunnel than the shortest one?

8. Is the Sideling Hill Tunnel more or less than 2 times as long as Rays Hill Tunnel? Prove that your answer is correct.

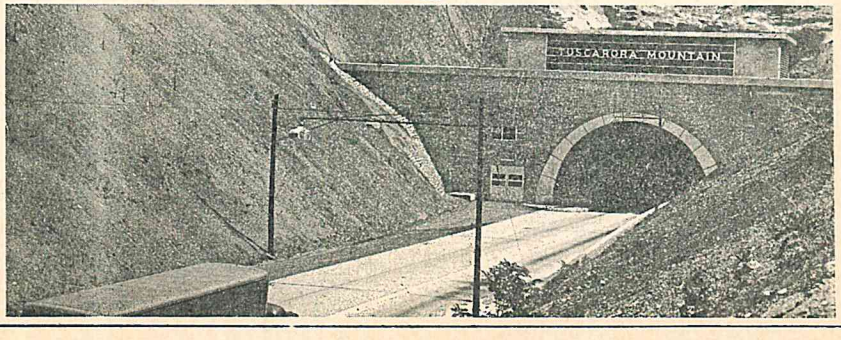
9. How many miles of tunnels are there in all on this Turnpike?

10. The Turnpike is 159.6 miles long. How many miles of highway are there that are not tunnels?

11. The toll charge for an automobile is $1.50 for one way. For a round-trip ticket the charge is the same as for $1\frac{1}{2}$ fares. How much does a round-trip ticket cost?

***12.** What advantages can you see that this road has over other highways?

***13.** If someone in your class has traveled over this highway, ask him to tell about the trip.



READING AND WRITING DECIMAL FRACTIONS

In these sentences decimals are used instead of common fractions. Read the sentences. Be ready to write the numbers from dictation both as decimals and as fractions.

1. We rode 7.25 miles on our bicycles yesterday.
2. Yesterday .17 inch of rain fell.
3. The average weight of eggs is about 1.8 ounces.
4. Cork weighs .24 as much as water.
5. The people in the United States eat on the average about 15.2 pounds of butter a year.
6. We produce about 12.78 bushels of wheat an acre.
7. The world record for the 100-yard dash is 9.4 seconds.

Write the following in fractional form:

8. .6; .9; .18; .06; .04; .87.
9. 3.6; 7.9; 8.15; 6.08; 9.05; 6.1.

Write the following as decimals:

10. $3\frac{7}{10}$; $8\frac{15}{100}$; $9\frac{31}{100}$; $8\frac{4}{10}$; $6\frac{85}{100}$.
11. $\frac{5}{10}$; $\frac{35}{100}$; $\frac{8}{100}$; $\frac{17}{100}$; $\frac{6}{10}$.

A QUICK REVIEW OF FRACTIONS

1. Express in simplest form:

a. $1\frac{1}{4}$ *b*. $6\frac{2}{4}$ *c*. $8\frac{2}{2}$ *d*. $9\frac{5}{4}$ *e*. $8\frac{6}{4}$

Find the answers to the following:

	a	*b*	*c*	*d*	*e*	*f*
2.	$3\frac{1}{8}$ $+4\frac{1}{8}$	$3\frac{3}{4}$ $-2\frac{1}{4}$	$\frac{7}{8}$ $-\frac{1}{8}$	$5\frac{1}{2}$ $+6\frac{1}{2}$	14 $-9\frac{1}{2}$	$6\frac{2}{3}$ $+4\frac{2}{3}$
3.	$6\frac{1}{2}$ $-2\frac{1}{2}$	$3\frac{1}{4}$ $+9\frac{1}{4}$	$8\frac{1}{4}$ $-5\frac{3}{4}$	5 $-4\frac{1}{4}$	$8\frac{3}{4}$ $+7\frac{3}{4}$	$9\frac{1}{3}$ $-7\frac{2}{3}$

4. Find the sum of $6\frac{7}{10}$, $7\frac{1}{10}$, and $9\frac{5}{10}$ first as fractions, then as decimals.

RAINY WEATHER

1. For four weeks Jack kept a record of the rainfall where he lives. Beginning the first week the record showed 1.04 inches, 1.51 inches, 0.57 inches, and 2.30 inches. How much was the total rainfall?

1.04
1.51
0.57
2.30
5.42

THINK: 1.04 + 1.51 + 0.57 + 2.30 = ?
In copying decimals be sure to write tenths under tenths and hundredths under hundredths. Keep the decimal points in a straight column as shown at the left. First add the hundredths. The sum is 12 hundredths, or 1 tenth and 2 hundredths. Write 2 under hundredths and carry the 1 to the tenths' column. Add the tenths. The sum is 14 tenths, or 1 and 4 tenths. Write the .4 and carry the 1 to the ones' column. Add the ones. The sum is 5. Write 5. Be sure to put the decimal point in the answer. 5.42 inches of rain fell in the four weeks.

2. How is adding hundredths like adding money?

3. In that year Jack found that 3.23 inches of rain fell in May, 2.60 inches in June, and 1.08 inches in July. How much rain fell in the three months?

4. Use fractions to find the rainfall in these three months.

Find the sums:

	a	*b*	*c*	*d*	*e*
5.	7.45	7.48	67.48	97.6	27.89
	5.63	6.47	93.45	85.4	9.65
	8.98	9.65	23.57	36.5	6.42
6.	12.6	9.84	87.4	3.86	56.64
	2.5	7.00	95.6	.98	.09
	0.8	.09	68.4	.04	8.74

7. Find the sum of 3.6, 24.8, 9.6, and .9.

SUBTRACTING HUNDREDTHS

1. During one month 7.45 inches of rain fell. Jack said that the average for this month is only 4.38 inches of rain. How much more rain than the average fell?

$$\begin{array}{r} 7.45 \\ -4.38 \\ \hline 3.07 \end{array}$$

THINK: 7.45 inches − 4.38 inches = ?
In subtracting decimals be sure to place hundredths under hundredths, tenths under tenths. Subtract just as in subtracting dollars and cents. Subtract hundredths first, then tenths, then ones. Is the decimal point placed correctly in the answer? Why must the answer be in hundredths?
3.07 in. more of rain fell.

2. During July it was very hot and dry. Only .36 inch of rain fell. The average rainfall for July was 3.07 inches. How much less than the average amount of rain fell?

Subtract these numbers. Then check by adding.

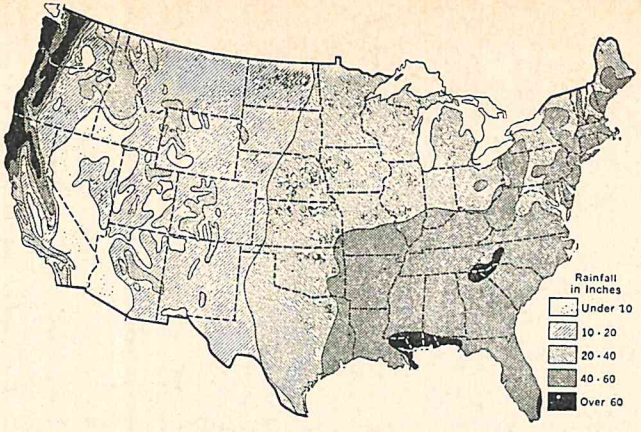
	a	*b*	*c*	*d*	*e*
3.	3.75 1.48	64.75 37.86	97.46 87.95	37.84 9.58	88.67 .04
4.	37.8 4.2	3.8 2.6	9.85 3.70	375.4 86.5	97.86 4.86

5. Subtract three and seven hundredths from nine and two hundredths.

ZERO AS A PLACE HOLDER

1. In the number 500.03 in what places are there zeros? What do the zeros show?

2. Write with figures: six hundred three and seven hundredths.



RAINFALL IN THE UNITED STATES

This map shows the amounts of yearly rainfall in different parts of the country. The shading shown in the rectangles in the lower right-hand corner helps you to tell the amount of rainfall in each state.

1. In what parts of the country do we have the heaviest rains, according to the map? How much rain falls there?

2. In what states are there areas in which there is less than 10 inches of rain a year?

3. Name three states in which the rainfall varies from parts in which the rainfall is less than 10 inches a year to other parts in which the rainfall is over 60 inches a year. Can you tell what causes these differences in rainfall in these states?

4. In Winnemucca, Nevada, the average yearly rainfall is about 8 inches. How much is this a month? How much rain is an inch of rain?

5. In Mobile, Alabama, the average yearly rainfall is about 61 inches. How much is this a month?

*6. Use the map to find the rainfall in the state in which you live. What is a "drought"? How much rain falls during a storm?

RAINFALL DURING THE YEAR

There are large differences in the amount of rain that falls in different parts of the world.

	JAN.-FEB.	MAR.-APR.	MAY-JUNE	JULY-AUG.	SEPT.-OCT.	NOV.-DEC.	TOTAL
1. Albuquerque, N.M.	0.6	0.7	1.2	2.5	1.6	0.9	?
2. Boston, Mass.	7.2	7.9	6.8	7.7	7.1	7.9	?
3. Calcutta, India	0.4	4.5	45.5	44.3	16.5	4.1	?
4. London, England	3.5	3.4	4.1	5.0	4.7	4.4	?

1. Which of these places has the most rainfall in January and February? Which has the least rainfall in these months?

2. Which place has the most rainfall in May-June? Which place has the least rain in these months?

3. Does London have more rainfall than Boston?

4. Which place has the most rain during the year? Which place has the least rain? Estimate the total amounts.

5. Now find the total rainfall for each of these two places. Compare the totals with your estimates.

6. Find the totals for the other two places.

*7. How much more than 9 feet is the amount of rainfall in Calcutta each year?

PRACTICE WITH DECIMAL FRACTIONS

Find the sums:

1. $\begin{array}{r} 8.7 \\ 9.6 \\ \underline{5.8} \end{array}$

2. $\begin{array}{r} 27.6 \\ 8.5 \\ \underline{97.8} \end{array}$

3. $\begin{array}{r} 8.74 \\ 9.65 \\ \underline{.87} \end{array}$

4. $\begin{array}{r} 27.65 \\ 8.97 \\ \underline{.46} \end{array}$

5. $\begin{array}{r} 39.6 \\ 8.4 \\ \underline{378.4} \end{array}$

6. $87.64 + 97.86 + 8.67 + 40.59 =$

Subtract these numbers:

7. $\begin{array}{r} 85.6 \\ \underline{-27.9} \end{array}$

8. $\begin{array}{r} 8.53 \\ \underline{-2.76} \end{array}$

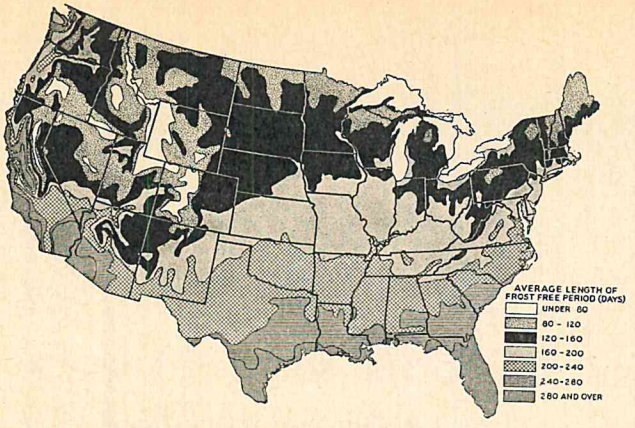
9. $\begin{array}{r} 16.85 \\ \underline{-7.47} \end{array}$

10. $\begin{array}{r} 80.04 \\ \underline{-1.08} \end{array}$

11. $\begin{array}{r} 64.8 \\ \underline{-24.9} \end{array}$

12. $38.4 - 14.8 = ?$

13. $48.65 - 2.48 = ?$



THE LENGTH OF OUR GROWING SEASON

Our government has made studies of the average length of the growing season (frost free days). This information is important because it helps us to decide what kinds of crops to plant. The map above shows the average length of the frost free period in all parts of the country.

1. In what parts of the country are the frost free periods longest? How can you tell from the map?

2. How can you tell that in some places the growing season is less than 80 days? About how many months is this?

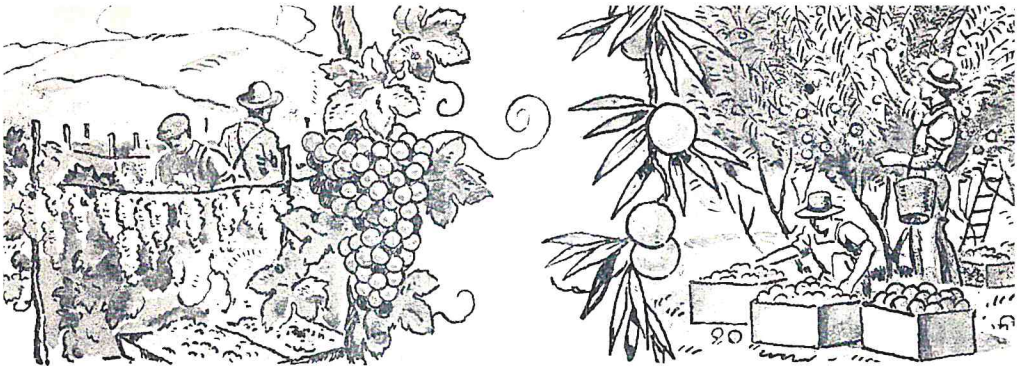
3. Show that the growing season in all parts of California is not the same. Why is this?

4. Which state has a longer growing season, Minnesota or Missouri?

5. How long is the frost free period in northern North Dakota, Minnesota, and Wisconsin?

6. It takes about 200 days for cotton to grow. In what parts of our country is the growing season long enough to raise cotton? Can one raise cotton in Nebraska? in Arizona? in Iowa? Prove your answers.

*7. Is the growing season the same length each year? How do we tell when the growing season begins and ends?



HOW LARGE ARE SOME OF OUR CROPS?

These problems are about the crops in one of our western states in a recent year.

1. In this state the average number of bushels of wheat produced an acre was 17.7. The best crop was on a farm that produced 30.2 bushels an acre. How much more an acre than the average was produced on the best farm?

2. One of the poorest crops of wheat was on a farm that produced only 3.6 bushels an acre. How much less than the average was this? How much less than the best crop? Why does the amount of wheat produced differ so much from farm to farm?

3. The average amount of alfalfa produced an acre was 3.5 tons. The best crop was 12.0 tons an acre. Find the difference.

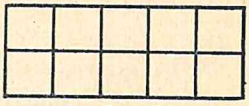
4. Mr. Johnson had two peach orchards, each an acre in size. One produced 1.4 tons of dried peaches, the other 1.5 tons of dried peaches. How many tons did he get from the two orchards?

5. Mr. Jordan had two fields of grapes each an acre in size. One produced 3.2 tons of grapes, the other 3.3 tons of grapes. How many tons did the two fields produce?

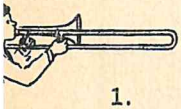
*6. In what states are the crops raised that these problems tell about?

QUICK THINKING WITH DECIMALS

1. Which is more, .1 foot or .01 foot?
2. Express as a fraction the decimal .17.
3. Show by changing .5 to a fraction and reducing the fraction that .5 equals $\frac{1}{2}$.
4. What fraction has the same value as the decimal .25?
5. Draw a box like the one at the right and shade .3 of it. What part of your box is not shaded?



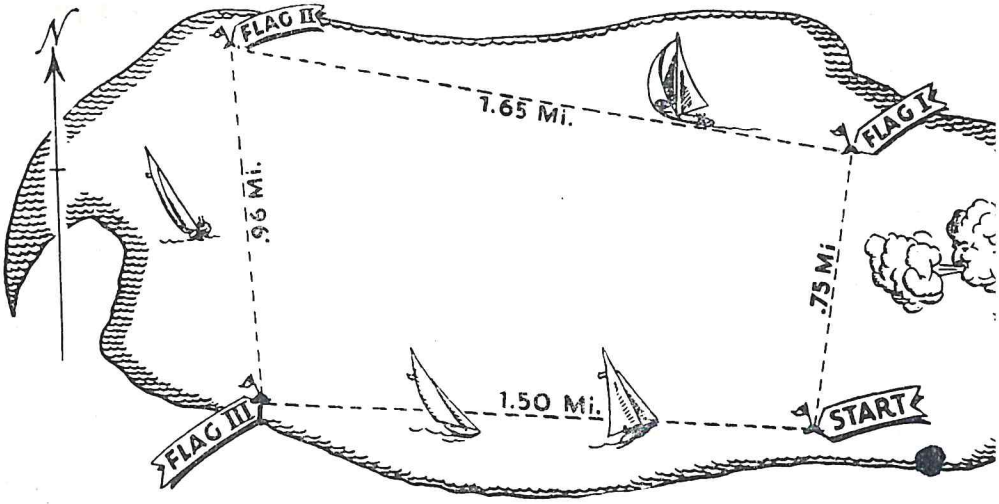
6. If you shade $\frac{1}{2}$ of the box, how many tenths do you shade in all?
7. Which is more, 2.1 quarts or 1.75 quarts?
8. Arrange these numbers in order of their value, placing the number of largest value first:
   - *a.* .56, 7.4, 3.16, 40, 29.75
   - *b.* .9, .45, 78, 14.7, 33.84
   - *c.* 65.1, 120, 1.2, 12.0, .12
   - *d.* $\frac{3}{10}$, 2.7, .02, $3\frac{1}{10}$, .15
   - *e.* $\frac{15}{100}$, .76, .8, 7.6, $\frac{1}{10}$
   - *f.* $8\frac{1}{10}$, .9, 9.2, $\frac{13}{100}$, .87
9. Show that 500 is half a thousand.



LET'S PRACTICE

	a	*b*	*c*	*d*	*e*
1.	8.7 -2.8	380 $\times 74$	76.84 $+97.94$	8 $-6\frac{1}{2}$	9.72 -5.82
2.	$7\frac{2}{3}$ $-4\frac{2}{3}$	26.5 $+5.4$	$7\frac{3}{4}$ $+9\frac{3}{4}$	29.0 -26.5	$6\frac{1}{4}$ $+8\frac{1}{4}$
3.	$85\overline{)6170}$	$7\frac{1}{2}$ $+9\frac{1}{2}$	85.04 -26.08	805 $\times 60$	$32\overline{)6746}$

4. Add 7.4, 16.5, 27.8, and 0.5.



SAILBOAT RACES

This map shows the distances between four markers on Lake Calhoun that show the people in the sailboats where they should sail during the summer races.

1. How far is it from "Start" to Flag I?

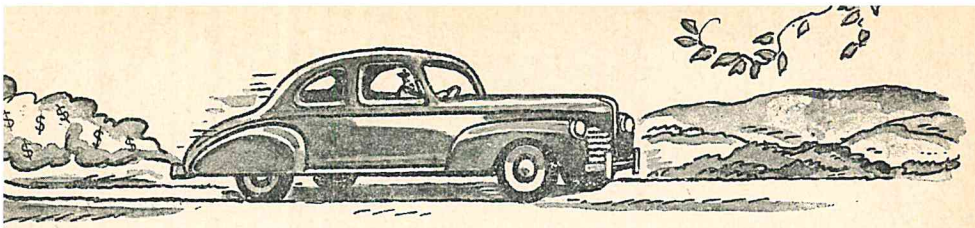
2. Between what two points is the distance greatest? Between what points is the distance least?

3. Find the distance from "Start" to Flag II by way of Flag I.

4. Find the total distance around the course, from "Start" to Flag I, then to Flag II, then to Flag III, and then back to "Start."

5. Sailboats cannot sail in straight lines from one flag to the next one because of the differences in the direction of the wind after the sailboats are turned at the flags. In one race a sailboat had to sail a distance of about 5.6 miles in going around the flags once. How much farther was this than the total distance between the four flags?

*6. What is meant by "tacking"? When the wind is from the east on Lake Calhoun, between what two flags can the boats sail fastest? When would the boat have to tack?



THRIFTY DRIVING IS SAFE DRIVING

Fast driving is both dangerous and wasteful. The box at the right shows that when a certain kind of car was driven at slow speeds in a test it went more miles on each gallon of gasoline than when driven at high speeds.

Speed	Miles a Gallon
30 mi.	20.1 mi.
50 mi.	17.4 mi.
70 mi.	13.6 mi.

1. According to the table how many miles a gallon did the automobile go when it went at the speed of 30 miles an hour? at 50 miles an hour? at 70 miles an hour?

2. How many more miles a gallon did the car go at a speed of 30 miles an hour than at a speed of 50 miles an hour? at 70 miles an hour?

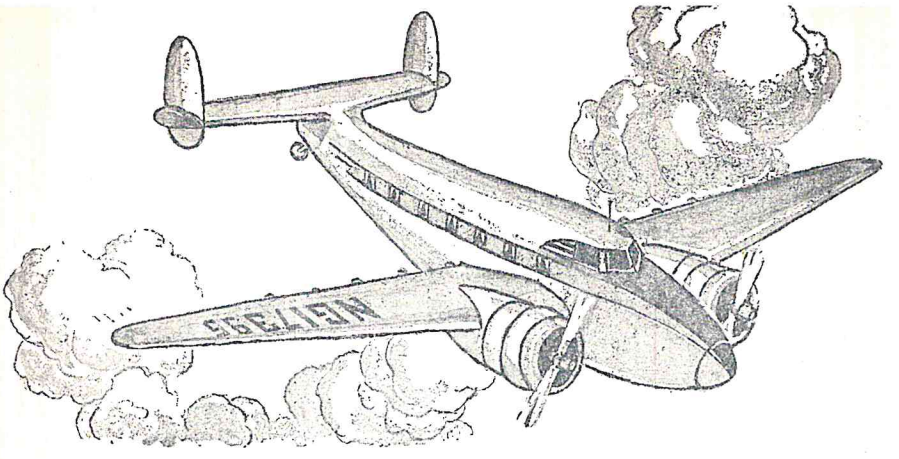
3. How many less miles a gallon did the automobile go at a speed of 70 miles an hour than at a speed of 50 miles an hour?

4. Bob's father has a car of this kind. In city driving where there are many starts and stops he makes only 12.7 miles on a gallon of gasoline. How much less is this than the number of miles listed for a speed of 30 miles an hour?

5. On a long drive he made 18.2 miles a gallon. How much more was this than he made in city driving?

*6. Inquire from a number of owners of different kinds of cars to find how many miles a gallon they make in city driving. Why do not all cars go the same number of miles on a gallon of gasoline?

*7. Why is safe driving thrifty driving?



AMERICAN HIGHWAYS IN THE SKY

1. In 1929 there were 41,723 miles of air routes in this country. Ten years later there were 71,199 miles of air routes. What was the increase?

2. During that time the passenger fare a mile dropped from 10.6 cents a mile to 5.7 cents a mile. Find the decrease.

3. In a recent year our planes flew 66,071,500 miles in this country and 10,924,700 miles on foreign routes. How many miles did they fly in all? What are some of the important air routes in this country?

4. That year the planes used 41,500,000 gallons of gasoline. Find the cost of the gasoline at 40¢ a gallon. (Aviation gasoline costs more than regular gasoline. Why?)

5. The distance from New York to Los Angeles by airplane is 2,649 miles. By way of Panama Canal by ship the distance is 5,677 miles. How much more than two times the distance by airplane is the distance by ship?

*6. Engineers think that commercial planes will soon fly at a height of 35,000 feet at a speed of 400 miles an hour. How much more than 6 miles is 35,000 feet? Why can planes fly more swiftly at this height than at 3,000 feet?

DIAGNOSTIC TEST IN ADDITION OF DECIMALS

Work these examples carefully. Watch the decimal points. If you make only one or two errors in a row of examples, correct your work at once. If you make three or more errors, turn for help to the pages indicated at the ends of the rows.

	a	*b*	*c*	*d*	*e*	*f*	
1.	.7	.4	.6	3.5	2.2	3.6	(276)
	.2	.3	.2	2.4	.7	47.3	
2.	.6	.8	.4	3.5	4.8	.6	(277)
	.7	.9	.8	2.6	.8	27.8	
3.	.27	.16	.79	3.01	8.04	.86	(291)
	.36	.28	.88	4.02	29.73	.04	
	.44	.31	.95	6.05	6.85	2.00	

4. Copy and add: 21.8, 2.9, and 6.8. (277)
5. Copy and add: 327.38, 16.57, and 8.36. (291)

DIAGNOSTIC TEST IN SUBTRACTION OF DECIMALS

Have you any difficulties in subtraction of decimals?

	a	*b*	*c*	*d*	*e*	*f*	
1.	.8	.7	.9	3.6	7.9	27.8	(279)
	.4	.3	.9	2.5	.4	3.5	
2.	.28	.76	.86	3.65	9.87	57.85	(292)
	.26	.35	.54	2.43	.64	3.21	
3.	3.2	8.8	3.76	.81	3.25	8.4	(279)
	1.7	2.9	1.98	.27	2.78	.7	

Subtract:

4. $27.8 - 6.9 =$ 6. $.97 - .49 =$ 8. $68.5 - .7 =$ (279)
5. $23.86 - 4.74 =$ 7. $3.2 - .6 =$ 9. $86.37 - .08 =$ (292)

THE DOCTOR MEASURES TEMPERATURE

Jack was sick in bed when the doctor came. One of the first things that he did was to find out if Jack had a fever. To do this he used a **clinical thermometer,** like the one shown in the picture at the left. He placed it under Jack's tongue, and after it had been in his mouth for two or three minutes the doctor removed it and looked at the scale to find Jack's temperature.

1. Normal temperature is 98.6 degrees (°). If Jack has a temperature of more than this, we say he has a fever. Suppose that Jack's temperature is 103.6°. How much above normal is this?

2. How much below normal is a temperature of 97.6°?

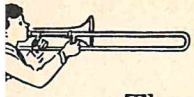
3. One morning a sick girl had a temperature of 101.2°. That night her temperature had risen to 103.0°. How many degrees had her temperature risen?

4. A nurse at the hospital said, "This boy has 3 degrees of fever." What was his temperature?

5. Look at the scale on the thermometer in the picture. In what ways is the scale different from the scale on the thermometer we use for measuring the temperature out of doors or in our homes? How low a temperature can we measure with a clinical thermometer? How high a temperature?

6. To help us to measure a sick person's temperature very accurately, the space for one degree on the scale is divided into five parts, each equal to 0.2 degree. Point to the place on the scale showing a temperature of 100.2°; 103.8°; 102.7°.

*7. Why is it not necessary to use a thermometer scaled in fifths of a degree to measure temperature out of doors?



LET'S PRACTICE

These sets of examples contain the important kinds of examples you have learned to work. Use these sets for practice, one set a day. You may also repeat a set on several days to see if you can improve your work. Try to get every example correct.

Set I

1. $96.9 + 47.6 + 56.7 + 81.2 + 57.5 + 43.6$

2. $38.4 - 26.5$

3. $9\frac{1}{2} + 7\frac{1}{2}$

4. $8\frac{3}{4} - 7\frac{1}{4}$

5. $\frac{1}{4}$ of 50 =

6. $3.76 + 8.05$

7. $5'4'' - 2'8''$

8. $63\overline{)3529}$

9. 807×38

10. $84\overline{)34104}$

Set II

1. $3.08 + 4.17 + 4.78 + 4.95 + 9.65 + 8.32$

2. $9.75 - 6.87$

3. $6\frac{1}{4} + 8\frac{1}{4}$

4. $6\frac{1}{4} - \frac{1}{4}$

5. $46\overline{)1070}$

6. $6.8 + 7.9$

7. $\frac{1}{8}$ of 60 =

8. 490×50

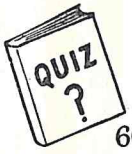
9. $9 - 2\frac{1}{2}$

10. $75\overline{)24061}$

USING THE LANGUAGE OF ARITHMETIC

Give at least two words that mean about the same as each of the following:

expensive	contains	money	worker	shape
large	possessions	compute	divide	value
buy	increase	clerk	answer	round
reduce	dealer	gain	spend	property



HOW WELL DO YOU REMEMBER?

1. What does each figure in this number stand for? 60,385.21

2. Why do we use the decimal point?

3. Write in words: 20.1; 6.75; 90.04.

4. Write in both fractional and decimal form: seven tenths; sixteen hundredths; twelve and nine tenths; forty-five and six hundredths.

5. Find the sum of these two numbers, first with the numbers expressed in decimal form, then in fractional form: five and nine tenths plus six and seven tenths. Which way do you think is easier? Why?

6. Subtract in both ways the two numbers given in question 5. Which way do you think is easier? Why?

7. What part of a yard is 1 foot? 1 inch? Do you think that our system of measuring length is a decimal system?

8. What fraction has the same value as the decimal .75?

9. Which is more, .1 gallon or .01 gallon?

INFORMATION PLEASE!

1. Why are decimals used more commonly in books and newspapers than fractions?

2. Which are easier to add and subtract, decimals or fractions? Why?

3. How is rainfall measured? Are there places in the world where the rainfall is more than 9 feet in a year?

4. What use is made of the "speedometer"?

5. Why is our system of numbers called a "decimal" system?

6. Give reasons why the prices of our food change.

7. Tell some ways in which the doctor uses arithmetic.

MEASURING GROWTH IN PROBLEM SOLVING

1. If you cut 4 pies into sixths, how many pieces of pie are there?

2. Peter works in his father's store on Saturday afternoons from 1 o'clock to 5 o'clock. He is paid 25 cents an hour for his work. How much does he earn on a Saturday?

3. Kate has 3 quarters, 5 dimes, and 2 half dollars. How much money has she in all?

4. John is 57.7 inches tall. Arthur is 60.2 inches tall. How much taller than John is Arthur?

5. How much less than a mile is .7 mile?

6. Fred sells 20 papers a day. He makes 2 cents on each paper. How many days will it take him to earn the $4.00 he needs to buy a baseball suit?

7. A farmer has an orange grove that contains 1,440 trees planted in 32 rows. How many trees are there on the average in each row?

8. Find the distance around the outside of a farm that is .75 mile long and .45 mile wide.

9. At the butcher shop Jack bought two chickens for the Sunday dinner. One weighed 3 pounds 6 ounces, the other 2 pounds 12 ounces. How much did the two chickens weigh?

10. Jennie has a piece of ribbon 8 yards long. She wishes to cut it into 12 equal parts. How long should each piece be?

What Your Score Means

Unsatisfactory	Fair	Good	Excellent
0 1 2 3 4	5 6	7 8	9 10

ARE YOU READY FOR THE NEXT GRADE?

Use this test to find how well you have learned to work the kinds of examples you have studied. Copy the numbers carefully and try to have every answer correct.

1. Subtract 38568 from 91004. (17)
2. How much is 10×47? (48)
3. Multiply 807 by 96. (69)
4. Reduce to lowest terms: $\frac{10}{12}$; $\frac{10}{20}$; $\frac{4}{8}$. (94)
5. Express in simplest form: $7\frac{2}{2}$; $6\frac{4}{3}$; $8\frac{6}{4}$. (94)
6. How much is $3\frac{1}{4} + 4\frac{3}{4}$? (168)
7. Find the sum of $2\frac{1}{4} + 3\frac{1}{4}$. (168)
8. Subtract: $6\frac{7}{8} - 5\frac{1}{8} = ?$ (114)
9. Add: $6\frac{1}{2}$ in. $+ 7\frac{1}{2}$ in. $+ 4\frac{1}{2}$ in. $= ?$ (165, 168)
10. Subtract $5\frac{1}{2}$ inches from 9 inches. (183)
11. How much less than $8\frac{1}{4}$ feet are $6\frac{3}{4}$ feet? (189)
12. Divide 5286 by 82 and check. (211)
13. Divide and check: $4573 \div 76 = ?$ (211)
14. Divide 49276 by 97. (222)
15. Add 6 feet 7 inches and 9 feet 8 inches. (248)
16. Subtract 4 pounds 2 ounces from 8 pounds 9 ounces. (250)
17. How much is $7.1 + 8.9 + 63.4$? (277)
18. Find the sum of 6.75, 8.73, and .69. (277, 291)
19. How much less than 75.2 is 6.7? (279)
20. Subtract 26.87 from 97.82. (292)

After your paper has been marked, correct your work at once. If you need help, turn to the pages given at the right. Do not be satisfied until you can work every example correctly.

TABLES OF MEASURES

For Reference

Counting

12 things = 1 dozen
12 dozen = 1 gross
20 things = 1 score

Capacity

Liquid Measure

4 gills = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon
31½ gallons = 1 barrel
231 cubic inches = 1 gallon

Dry Measure

2 pints = 1 quart
8 quarts = 1 peck
4 pecks = 1 bushel
2,150.42 cubic inches = 1 bushel

Weight

Avoirdupois Weight

16 ounces = 1 pound
100 pounds = 1 hundredweight (cwt.)
2,000 pounds or 20 hundredweight = 1 ton
2,240 pounds = 1 long ton

196 pounds = 1 barrel of flour
62.5 pounds = 1 cubic foot of water
*60 pounds = 1 bushel of wheat or potatoes
*56 pounds = 1 bushel of corn or rye

* In most states.

Troy Weight

For jewels and precious metals
24 grains = 1 pennyweight (pwt.)
20 pennyweights = 1 ounce
12 ounces = 1 pound
5,760 grains = 1 pound (Troy)
7,000 grains = 1 pound (Avoirdupois)
4 grains = 1 carat

Length

12 inches = 1 foot
3 feet = 1 yard
16½ feet or 5½ yards = 1 rod
5,280 feet / 1,760 yards / 320 rods = 1 mile

Surface or Square Measure

144 square inches = 1 square foot
9 square feet = 1 square yard
30¼ square yards = 1 square rod
160 square rods or 43,560 square feet = 1 acre
640 acres = 1 square mile, or 1 section
36 sections = 1 township

Time Measure

60 seconds = 1 minute
60 minutes = 1 hour
24 hours = 1 day

TABLE OF MEASURES—(Continued)

7 days = 1 week
365 days = 1 year
366 days = 1 leap year

Metric System (Equivalents)

10 millimeters = 1 centimeter
100 centimeters = 1 meter
1,000 meters = 1 kilometer

1 inch = 2.54 centimeters
1 foot = 30.48 centimeters
1 yard = 0.9144 meters
1 mile = 1.6093 kilometers